छत्तीसगढ़ माध्यमिक शिक्षा मण्डल, रायपुर

xf.kr

d{kk XII

lEiy i'u&i=

¼fo|kfpr bdkb½

NÙkh lx< ek/;fed f'k{kk e.My] jk;iqj

i'u & i= dh ;ktuk

Scheme of Question Paper

fo"k;%& xf.kr | i.kkd % 100
le; % 3 ?kV

ijh{kk % gk;j ld.Mjh

¼v½ 'k{kf.kd mnn'; d vulkj eku

(A) Weightage as per Educational objective:

l0 Ø0	mnn';	vd	ifr'kr
1-	Kku (Knowledge)	18	18%
2-	vock/k (Understanding)	62	62%
3-	vui;kx ,o dk'ky (Application & Skill)	20	20%
	;kx	100	100%

¼c½ bdkbokj vdk dk eku

l0Ø0	bdkb dk uke	bdkb ij vkcfVr vd	i'u&i= d ik:i vulkj vkcfVr vd
1-	cht xf.kr	12	12
2-	ifryke f=dk.kfefr	05	05
3-	lfn'kk dk x.kuQy	05	05
4-	fun'kkd T;kfefr	14	14
5-	vodyu	10	10
6-	lekdyu	14	14
7-	vody lehdj.k	05	05
8-	lkf[;dh	10	10
9-	;kf=dh	10	10
10-	vkfdd fof/k;k	05	05
11-	cfy;u cht xf.kr	05	05
12-	lpuk ik|kfxdh	05	05

¼l½ dfBukb Lrj (Difficulty Level)

l0 Ø0	mnn';	vd	ifr'kr
1-	ljy (Easy)	18	18%
2-	vkSlr (Average)	62	62%
3-	dfBu (Difficult)	20	20%
	;kx	100	100%

¼n½ i'ui= fn'kk fun'k ,o fodYi ;ktuk %&

(Instruction's & Scheme of Option for Question Paper)

- oLrfu"B i'u e ¼05½ cgfodYih; i'u rFkk ¼05½ fjDr LFkku dh ifr@mfpr tkMh cuk, dk i'u fn;k tkoxk vkj ;g iR;d lV e i'u Øekd 1 gkxk A
- iR;d lV e 1] 2 ,o 3 vdk d i'uk e fHkUurk jgxh A leLr 04 vd ;k bll vf/kd vdk d y?kmÙkjh; rFkk nh?kmÙkjh; i'uk e fodYi fn;k tkuk g A fodYi i'u mlh bdkb l rFkk leku mnn';k d jgx A 04 vd ;k bll vf/kd vdk d i'u iR;d lV e ,d leku jgx A
- vf/kdre mÙkj lhek

vfry?kmÙkjh;	¼2 vd@30 'kCn½	¼3 vd@50 'kCn½
y?kmÙkjh;	¼4 vd@75 'kCn½	¼5 vd@150 'kCn½
nh?kmÙkjh;	¼6 vd ;k vf/kd@250 'kCn½	

i'u & i= dk CyfiUV

Blue Print of Question Paper

fo"k;%& xf.kr	i.kkd % 100
	le; % 3 ?kV

ijh{kk % gk;j ld.Mjh

bdkb l-Ø-	bdkb	bdkb ij vkcfVr vd	vdokj i'u							dy i'u
			1 vd	2 vd	3 vd	4 vd	5 vd	6 vd	6 vd ;k bll vf/kd	
1	chtxf.kr	12	2	1	&	2	&	&		5
2	ifryke f=dk.kfefr	5	&	1	1	&	&	&		2
3	lfn'kk dk x.kuQy	5	&	1	1	&	&	&		2
4	fun'kkd T;kfefr	14	2	1	&	1	&	1		5
5	vodyu	10	2	&	&	2	&	&		4
6	lekdyu	14	1	1	&	&	1	1		4
7	vody lehdj.k	5	&	1	1	&	&	&		2
8	lkf[;dh	10	2	&	1	&	1	&		4
9	;kf=dh	10	1	&	&	1	1	&		3
10	vkfdd fof/k;k	5	&	&	&	&	1	&		1
11	cfy;u chtxf.kr	5	&	1	1	&	&	&		2
12	lpuk ik|kfxdh	5	&	1	1	&	&	&		2
	;kx	100	1	8	6	6	4	2	&	27

Set - A

gkb Ldy lfVfQdV ijh{kk

High School Certificate Examination

lEiy&i'u i=

SAMPLE PAPER

fo"k; % **(Subject)** - xf.kr | le; 3 ?k.Vk **(Time- 3 Hrs)**
d{kk % **(Class)** - ckjgoh | i.kkd 100 **(M.M.)**

(Instruction) & %funs'k%

1- lHkh i'u gy djuk vfuok; g A

Attempt all the Question

2- i'u Øekd 01 e 10 vd fu/kkfjr g A nk dky[k.M g A [k.M ^^v** e 05 cgfodYih; i'u rFkk [k.M ^^c** e 05 fjDr LFkkuk dh ifr vfkok mfpr lc/k tkfM, A iR;d i'u d fy, 1 vd vkcfVr g A

Q. No. 01 Carries 10 Marks. There are two sub-section, Section A is Multiple choice carries 05 marks and section B is fill in the blanks or match the column carries 05 marks.

3- i'u Øekd 02 l i'u Øekd 09 rd vfr y?kmRrjh; i'u g A iR;d i'u ij 02 vd vkcfVr g A mRrj dh vf/kdre 'kCn lhek 30 'kCn A

Q. No. 2 to 09 are very short answer type question & it carries 02 marks each. Word limit is maximum 30.

4- i'u Øekd 10 l i'u Øekd 15 rd y?kmRrjh; i'u g A iR;d i'u ij 03 vd vkcfVr g A mRrj dh vf/kdre 'kCn lhek 50 'kCn A

Q. No. 10 to 15 are short answer type question & it carries 03 marks each. Word limit is maximum 50.

5- i'u Øekd 16 l i'u Øekd 21 rd y?kmRrjh; i'u g A iR;d i'u e vkrfjd fodYi g vkj iR;d i'u ij 04 vd vkcfVr g A mRrj dh vf/kdre 'kCn lhek 75 'kCn A

Q. No. 16 to 21 are short answer type question & it carries 04 marks each. Each question has internal choice. Word limit is maximum 75.

6- i'u Øekd 22 l i'u Øekd 25 rd nh?kmRrjh; i'u g A iR;d i'u e vkrfjd fodYi g vkj iR;d i'u ij 05 vd vkcfVr g A mRrj dh vf/kdre 'kCn lhek 100 'kCn A

Q. No. 22 to 25 are long answer type question & it carries 05 marks each. Each question has internal choice. Word limit is maximum 100.

7- i'u Øekd 26 l i'u Øekd 27 rd nh?kmRrjh; i'u g A iR;d i'u e vkrfjd fodYi g vkj iR;d i'u ij 06 vd vkcfVr g A mRrj dh vf/kdre 'kCn lhek 150 'kCn A

Q. No. 26 to 27 are long answer type question & it carries 06 marks each. Each question has internal choice. Word limit is maximum 150.

Ik'Uk 1 ¼v½ Lkgh f0kdYIk dk Pk¸kUk dhfTk, &

1- $\begin{vmatrix} 1 & bc & a(b+c) \\ 1 & ca & b(c+a) \\ 1 & ab & c(a+b) \end{vmatrix}$ dk EkkUk D¸kk gkXkk&

(a) $ab+bc+ca$ (b) abc

(c) 0 (d) $2abc$

2- vk0¸kg A = $\begin{bmatrix} 2 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 6 \end{bmatrix}$ dkUk Lkk vk0¸kg gA

(a) f0kd.k vk0¸kg (b) RkRLkEkd vk0¸kg

(c) vkn'k vk0¸kg (d) LkEkfEkRk vk0¸kg

3- ¸kfn LkEkRkYk $Ax + By + Cz + D = 0$ x–v{k d LkEkkUkkRkj g Rkk D¸kk gkXkk &

(a) A = 0 (b) B = 0

(c) C = 0 (d) D = 0

4- $\int \tan^2 x dx$ dk EkkUk gkXkk&

(a) $\sec x . \tan x$ (b) $\sec^2 x$

(c) $\tan x - x$ (d) $\tan x + x$

5- LkgLkCk/k Xk.kkd r dk EkkUk gkRkk g&

(a) $r \le 0$ (b) $r \ge 0$

(c) $-1 \le r \le 1$ (d) $-1 \le r \le 0$

Que 1 (A) Choose the correct answer :-

1. The value of $\begin{vmatrix} 1 & bc & a(b+c) \\ 1 & ca & b(c+a) \\ 1 & ab & c(a+b) \end{vmatrix}$

(a) $ab+bc+ca$ (b) abc

(c) 0 (d) $2abc$

2. Matrix A = $\begin{bmatrix} 2 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 6 \end{bmatrix}$ is which type of matrix -

(a) Diagonal matrix (b) Scalar matrix

(c) Square matrix (d) Identity matrix

3. If Ax + By + Cz + D = 0 is parallel to x–axis, then -

(a) A = 0 (b) B = 0

(c) C = 0 (d) D = 0

4. The value of $\int \tan^2 x dx$ is -

(a) sec$x$.tan$x$ (b) sec^2x

(c) tan$x$ – x (d) tan$x$ + x

5. The value of coefficient of correlation will be :

(a) $r \leq 0$ (b) $r \geq 0$

(c) $-1 \leq r \leq 1$ (d) $-1 \leq r \leq 0$

¼c½ fjDRk LFkkUkk dh lkfRk djk&

1- nk fCknvk ¼3] 4] 2½ vkj ¼2] 3] &1½ Lk TkkUk 0kkYkh j[kk d fnd vUkLkkRk &&&& gkXkA

2- ¸kfn ,d XkfRkEkkUk d.k t LkEk¸k Ek s njh Rk¸k djRkk g] Rkk t LkEk¸k Lkj R0kj.k dk EkkUk &&& gkXkk A

3- $\frac{d}{dx}(\sec^{-1}x)$ dk EkkUk&&&&&&& gkRkk gA

4- YkhLk 0k"k Ek 53 jf0k0kkj gkUk dh lkfØ¸kRkk &&&& gkRkh gA

5- ¸kfn dkb d.k lkkjfHkd 0kXk u Lk {kfRkTk Lk α dk.k CkUkkdj lk{kfLkRk fd¸kk Tkk, Rkk mMM¸kUk dkYk &&&&& gkXkk A

(B) Fill in the blanks -

1. The direction ratio of line passing through the points (3, 4, 2) and (2, 3, –1) is ....

2. A particle is moving in a straight line. The distance travelled by it is s at

time *t*, the acceleration of particle at time *t* will be ....

3. The value of $\frac{d}{dx}(\sec^{-1} x)$ is ....

4. The probability that a leap year selected at random will contain 53 sunday is ....

5. A particle is projected with a velocity of *u* at an elevation α then the time of flight is ....

Ik'Uk 2- ¸kfn $\frac{x+1}{(x+2)(x+3)} = \frac{A}{x+2} + \frac{B}{x+3}$ g Rkk $A + B$ dk EkkUk KkRk dhfTk, A

If $\frac{x+1}{(x+2)(x+3)} = \frac{A}{x+2} + \frac{B}{x+3}$ then find the value of $A + B$

Ik'Uk 3- fLk) dhfTk, fd $\tan^{-1}\left(\frac{1}{3}\right) = \tan^{-1} {}^{3}\!/_{4}$

Prove that : $\tan^{-1}\left(\frac{1}{3}\right) = \tan^{-1} {}^{3}\!/_{4}$

Ik'Uk 4- Lkfn'k $\bar{a} = 3i + 4j + 5k$ dk Lkfn'k $\bar{b} = 2i + j + 2k$ Ikj Ik{kIk KkRk dhfTk,A

Find the projection of vector $\bar{a} = 3i + 4j + 5k$ on vector $\bar{b} = 2i + j + 2k$

Ik'Uk 5- LkEkRkYk $2x + 6y + 8z = 5$ d vfHkYkCk dh fnd dkT¸kk, KkRk dhfTk, A

Find the direction cosines of normal to the plane $2x + 6y + 8z = 5$.

Ik'Uk 6- $\int_0^{\pi/2} \sin x dx$ dk EkkUk KkRk dhfTk,A

Evaluate : $\int_0^{\pi/2} \sin x dx$

Ik'Uk 7- v0kdYk LkEkhdj.k $\frac{dy}{dx} = x \log x$ dk gYk dhfTk, A

Solve the differential equation : $\frac{dy}{dx} = x \log x$

Ik'Uk 8- CkfYk¸kUk CkhTkXkf.kRk $[B,+,']$ d fdLkh v0k¸kOk x d fYk, fLk) dhfTk, fd $x + 1 = 1$.

If $[B,+,']$ is Boolean Algebra and $x \in B$, then prove that $x + 1 = 1$.

Ik'Uk 9- bUVjUkV fdLk dgRk gA

What is internet.

Ik'Uk 10- LkjYkRkEk :Ik Ek 0¸kDRk dhfTk, $\cot^{-1}\left(\frac{1+\cos x}{\sin x}\right)$

Write $\cot^{-1}\left(\frac{1+\cos x}{\sin x}\right)$ in simplified form.

i'Uk 11- LkEkkUkkRkj PkRkHkTk dk {k«kQYk KkRk dhfTk, A fTkLkd f0kd.k $\bar{a} = 2i+3j+6k$ RkFkk $\bar{b} = 3i-6j+7k$ gA

Find he area of parallelogram whose diagonals are $\bar{a} = 2i+3j+6k$ and $\bar{b} = 3i-6j+7k$.

Ik'Uk 12- v0kdYk LkEkhdj.k $(x+y+1)\frac{dy}{dx}=1$ dk LkEkkdYkUk Xk.kkd KkRk dhfTk, A

Find the integrating factor of differential equation $(x+y+1)\frac{dy}{dx}=1$

Ik'Uk 13- ¸kfn ,d FkYk Ek 6 XkYkh] 4 LkQn RkFkk 5 gjh Xkn gA bLkEk Lk nk Xkn fUkdkYkh TkkRkh g] Rkk ,d dkYkh vkj ,d gjh Xkn fUkdkYkUk dh Ikkf¸kdRkk KkRk dhfTk, A

A bag contains 6 black, 4 white and 5 green balls. Find the probability of drawing a Black or a green ball form it.

Ik'Uk 14- CkfYk¸kUk QYkUk $f(x,y,z)=(x+y).(y+z)$ dk fL0kfPkXk IkfjIkFk [khfPk, A

Draw switching circuit for the Boolean function

$$f(x,y,z)=(x+y).(y+z)$$

Ik'Uk 15- ,LkECkYkj D¸kk g\ ¸kg fdRkUk Ikdkj dk gkRkk gA

What is an assembler? Write all he types of assembler.

Ik'Uk 16- EkkUk KkRk dhfTk, &

Find the vlaue of the determinant :

$$\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix}$$

¼vFkOkk½

EkkUk KkRk dhfTk, &

Find the value of the determinant :

$$\begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix}$$

Ik'Uk 17- ¸kfn $f(x) = x^2 - 5x + 7$ Rkk $f(A)$ dk EkkUk KkRk dhfTk,] TkCk $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$

If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ and $f(x) = x^2 - 5x + 7$, then find he value of $f(A)$

¼vFkOkk½

¸kfn $A = \begin{bmatrix} 2 & 3 & 1 \\ 3 & 4 & 1 \\ 3 & 7 & 2 \end{bmatrix}$ gk Rkk A^{-1} dk EkkUk KkRk dhfTk,A

If $A = \begin{bmatrix} 2 & 3 & 1 \\ 3 & 4 & 1 \\ 3 & 7 & 2 \end{bmatrix}$, then find the value of A^{-1}.

Ik'Uk 18- k dk EkkUk KkRk dhfTk, ¸kfn j[kk,¡ $\frac{x-1}{-3} = \frac{y-2}{2k} = \frac{z-3}{2}$ RkFkk $\frac{x-1}{3k} = \frac{y-5}{1} = \frac{z-6}{-5}$ IkjLIkj YkCkOkRk gA

The line $\frac{x-1}{-3} = \frac{y-2}{2k} = \frac{z-3}{2}$ and $\frac{x-1}{3k} = \frac{y-5}{1} = \frac{z-6}{-5}$ are perpendicular to each other, then find the value of k.

¼vFkOkk½

¸kfn XkkYk dk LkEkhdj.k $5(x^2+y^2+z^2) + 10x - 6y + 8z + 5 = 0$ g Rkk bLkdk dæ RkFkk f«kT¸kk KkRk dhfTk, A

Find the radius and centre of the sphere $5(x^2+y^2+z^2) + 10x - 6y + 8z + 5 = 0$.

Ik'Uk 19- ¸kfn $y = \tan^{-1}\sqrt{\frac{1+x}{1-x}}$ gk Rkk $\frac{dy}{dx}$ dk EkkUk KkRk dhfTk,

If $y = \tan^{-1}\sqrt{\frac{1+x}{1-x}}$, then find the value of $\frac{dy}{dx}$.

¼vFkOkk½

$\frac{\log x}{x}$ dk mfPPk"B EkkUk KkRk dhfTk, A

Find the maximum value of $\frac{\log x}{x}$.

Ik'Uk 20- ¸kfn $y\sqrt{1-x^2} + x\sqrt{1-y^2} = 1$ gk Rkk fLk) dhfTk, fd $\frac{dy}{dx} + \sqrt{\frac{1-y^2}{1-x^2}} = 0$

If $y\sqrt{1-x^2} + x\sqrt{1-y^2} = 1$, then prove that $\frac{dy}{dx} + \sqrt{\frac{1-y^2}{1-x^2}} = 0$.

¼vFkOkk½

¸kfn $x = a(t + \sin t)$ RkFkk $y = a(1 - \cos t)$ rk $\frac{dy}{dx}$ dk eku Kkr dhft ,A

If $x = a(t + \sin t)$ and $y = a(1 - \cos t)$ then find the value of $\frac{dy}{dx}$.

Ik'Uk 21- ,d d.k 30 fEkUkV Lkd.M d 0kXk Lk ÅIkj Ik{kfIkRk fd¸kk Xk¸kk RkFkk mLkh LkEk¸k ,d nLkjk d.k mLkh m/0kk?kj j[kk Ikj 90 EkhVj dh ÅPkkb Lk UkhPk fXkjk¸kk Xk¸kk KkRk dhfTk, fd 0k dCk vkj dgk fEkYkXk A

A particle is projected upwards with a velocity of 30 m/sec. and at the same time another particle is left fall from a height of 90 m in the same vertical line. Find when and where they will meet?

¼vFkOkk½

,d d.k fTkLk Ik{kIk fCknXkRk {kfRkTk LkEkRkYk Ikj CkUk ,d Yk{¸k Ikj Ikf{kRk dj Ikf{kIRk fd¸kk TkkRkk gA Yk{¸k Lk a Ekh- bLk vkj fXkjRkk ¼nj½ fXkjRkk g TkCkfd Ik{kIk dk.k α g RkFkk Yk{¸k b ehVj bl vkj ¼nj½ fxjrk g tcfd i{ki dk.k β gA ;fn nkUkk fLFkfRk¸kk Ek Ik{kIk 0kXk ,d LkEkkUk gk Rkk fLk) dhfTk, fd mlk¸kDRk mRFkkUk (Elevation)– $\frac{1}{2}\sin^{-1}\left[\frac{a\sin 2\beta + b\sin 2\alpha}{a+b}\right]$ gkXkk A

A particle aimed at a mark which is in a horizontal plane through the point of projection, falls *a* feet short of it when the elevation is α and goes *b* feet too far when the elevation is β. Show that, if the velocity of projection be the same in all cases, the proper elevation is–

$$\frac{1}{2}\sin^{-1}\left[\frac{a\sin 2\beta + b\sin 2\alpha}{a+b}\right].$$

Ik'Uk 22- $I = \int \sec^3 x dx$ dk EkkUk KkRk dhfTk, A

Evaluate : $I = \int \sec^3 x dx$

¼vFkOkk½

$I = \int \frac{x\sin^{-1} x}{\sqrt{1-x^2}} dx$ dk EkkUk KkRk dhfTk, A

Evaluate : $I = \int \frac{x\sin^{-1} x}{\sqrt{1-x^2}} dx$

Ik'Uk 23- fUkEUkfYkf[kRk Lkkj.kh Ek flkRkk vkj Ik«k dh ÅPkkb n'kk¸kh Xk¸kh g A bLkLk Lkg&LkCk/k Xk.kkd dh Xk.kUkk dhfTk, &

flkRkk dh ÅPkkb (x)	65	66	66	67	68	69	70
Ik«k dh ÅPkkb (y)	67	68	66	69	72	72	69

In the follwing table height of father and son are shown. Calculate the coefficient of correlation -

Height of father (x)	65	66	66	67	68	69	70
Height of son (y)	67	68	66	69	72	72	69

¼vFkOkk½

¸kfn nk LkEkkJ¸k.k j[kkvk (Regression lines) d CkhPk dk dk.k θ g Rkk fLk) dhfTk, fd $\tan\theta = \left(\frac{1-r^2}{r}\right)\left(\frac{\sigma x.\sigma y}{\sigma^2 x + \sigma^2 y}\right)$

If θ be gthe acute angle between the two regression lines of the variable x and y, then prove that : $\tan\theta = \left(\frac{1-r^2}{r}\right)\left(\frac{\sigma x.\sigma y}{\sigma^2 x+\sigma^2 y}\right)$

Ik'Uk 24- dk.k θ Ikj fØ¸kk djjg nk CkYk P vkj Q dk Ikfj.kkEkh CkYk $(2m+1)\sqrt{P^2+Q^2}$ d CkjkCkj g A TkCk CkYk $\left(\frac{\pi}{2}-\alpha\right)$ dk.k Ikj fØ¸kk djRk g Rkk Ikfj.kkEkh CkYk $(2m-1)\sqrt{P^2+Q^2}$ d CkjkCkj gkRkk g Rkk fLk) dhfTk, fd $\tan\alpha = \frac{(m-1)}{(m+1)}$

Two forces acting at angle θ are P and Q and has $(2m+1)\sqrt{P^2+Q^2}$ as resultant when they act at angle $\left(\frac{\pi}{2}-\alpha\right)$, then resultant force becomes $\left(\frac{\pi}{2}-\alpha\right)$, then prove that $\tan\alpha = \frac{(m-1)}{(m+1)}$

¼vFkOkk½

,d d.k Ikj Pkkj CkYk P, $2P$, $3\sqrt{3}P$ vkj $4P$ YkXk gA IkgYk RkFkk nIj] nIj rFkk RkhLkj] RkhLkj RkFkk PkkFk CkYkk d CkhPk d dk.k ØEk'k% 60°, 90°, 150° gk rk Ikfj.kkEkh CkYk dk IkfjEkk.k vkj fn'kk KkRk dhfTk, A

If four forces P, $2P$, $3\sqrt{3}P$ and $4P$ act on a point such that angle between first and second is 60°, second and third is 90°, third and fourth is 150°. Then find their resultant and direction.

Ik'Uk 25- fn¸kk Xk¸kk g fd $e^o = 1$, $e^1 = 2.72$, $e^2 = 7.39$, $e^3 = 20.09$, $e^4 = 54.60$ LkEkkdYk $\int_0^4 e^x dx$ dk EkkUk fLkEIkLkUk fUk¸kEk Lk KkRk dhfTk, A

Given that $e^o = 1$, $e^1 = 2.72$, $e^2 = 7.39$, $e^3 = 20.09$, $e^4 = 54.60$ Find the value of $\int_0^4 e^x dx$ by simpson's rule.

¼vFkOkk½

,d 0kØ fUkEUkfYkf[kRk fCknvk Lk gkdj TkkRkk g&

x	1	1-5	2	2-5	3	3-5	4
y	2	2-4	2-7	2-8	3	2-6	2-1

bLkLk LkEkYkECk PkRkHkTkh¸k fUk¸kEk Lk 0kØ x–v{k RkFkk j[kkvk $x = 1, x = 4$ Lk f?kj g, {k«k dk {k«kQYk KkRk dhfTk, A

A curve passes through the following points :

x	1	1.5	2	2.5	3	3.5	4
y	2	2.4	2.7	2.8	3	2.6	2.1

using trapezoidal rule find the area bounded by the curve x-axis and the line $x = 1, x = 4$.

Ik'Uk 26- mLk XkkYk dk Lkfn'k LkEkhdj.k KkRk dhfTk, fTkLkdk 0¸kkLk AB g Tkgk A vkj B d fUkn'kkd A¼2] &3] 4½ RkFkk B¼&5] 4] &7½ fn, gA XkkYk d LkEkhdj.k dk dkRkh¸k :Ik dh KkRk dhfTk, A bLkdh f«kT¸kk vkj dæ Hkh KkRk dhfTk, A

Find the vector equation of the sphere whose diameter is AB and the co-ordinate of ends A and B are (2, –3, 4) and (–5, 6, –7) respectively. Also find its equation in carterian form and find radius and centre of the sphere.

¼vFk0kk½

nk j[kkvk d CkhPk dh U¸kUkRkEk njh KkRk dhfTk, fTkUkd Lkfn'k LkEkhdj.k]

$\bar{r} = (i + j) + t(2i - j + k)$ RkFkk $\bar{r} = (2i + j - k) + s(3i - 5j + 2k)$ gA

Find the shortest distance between the lines $\bar{r} = (i + j) + t(2i - j + k)$ and $\bar{r} = (2i + j - k) + s(3i - 5j + 2k)$.

Ik'Uk 27- EkkUk KkRk dhfTk, &

Evaluate :

$$\int_0^{\pi/4} \log(1 + \tan x)\,dx$$

¼vFk0kk½

0kØ $x^2 = 4y$ vkj j[kk $x = 4y - 2$ d CkhPk dk {k«kQYk KkRk dhfTk, A

Find the area enclosed between the curve $x^2 = 4y$ and $x = 4y - 2$.

LkEIkYk lkIkj dk vkn'k lV&A

mÙkj 1- ¼v½ Lkgh fØkdYIk dk Pk¸kUk dhfTk,

1- (c) 0

2- (a) fØkd.k LkEkg

3- (a) A = 0

4- (c) $\tan x - x$

5- (c) $-1 \le r \le 1$

¼c½ fjDr LFkku dk Hkjk&

1- –1, –1, 3

2- $\dfrac{d^2 s}{dt^2}$

3- $\dfrac{1}{x\sqrt{x^2-1}}$

4- $2/7$

5- T = $\dfrac{2u\sin\alpha}{g}$

mÙkj 2- $\dfrac{x+1}{(x+2)(x+3)} = \dfrac{A}{x+2} + \dfrac{B}{x+3}$ ....(i)

$\Rightarrow$ $x + 1 = A(x+3) + B(x+2)$ ....(ii)

Let $x + 2 = 0 \Rightarrow x = -2$

x dk eku lehñ (ii) e j[ku ij

$-2+1 = A(-2+3) + 0$

$-1 = A \Rightarrow A = -1$

vc ekuk $x+3 = 0 \Rightarrow x = -3$

x dk eku lehñ (ii) e j[ku ij

$-3+1 = 0 + B(-3+2)$

$-2 = B \Rightarrow B = 2$

$\therefore$ $A + B = -1 + 2 = 1$

mÙkj 3- $2\tan^{-1}\left(\frac{1}{3}\right)=\tan^{-1}{}^{3}\!/_{4}$

L.H.S. $= 2\tan^{-1}\left(\frac{1}{3}\right)$

$$= \tan^{-1}\left(\frac{2.\frac{1}{3}}{1-\left(\frac{1}{3}\right)^2}\right)$$

$$= \tan^{-1}\left(\frac{{}^{2}\!/_{3}}{{}^{8}\!/_{9}}\right)$$

$$= \tan^{-1}{}^{3}\!/_{4} \quad \text{R.H.S.}$$

mÙkj 4- fn¸kk g $\overline{a}=3i+4j+5k$

$\overline{b}=2i+j+2k$

$\therefore \quad \overline{a}.\overline{b} = (3i+4j+5k).(3i+4j+5k)$

$= 6 + 4 + 10 = 20$

$|b| = \sqrt{4+1+4}=\sqrt{9}$

$= 3$

Lkfn'k 0k dk 5 Ikj Ik{kIk ¾ $\frac{\overline{a}.5}{|5|}=\frac{20}{3}$

mÙkj 5 fn¸kk g & LkEkRkYk dk LkEkhdj.k

$$2x + 6y + 8z = 5 \quad ....(i)$$

LkEkRkYk (i) d fnd ¾ 2]6]8

fnd dkT¸kk, ¾ $\frac{2}{\sqrt{104}},\frac{2}{\sqrt{104}},\frac{2}{\sqrt{104}}=\frac{1}{26},\frac{3}{\sqrt{26}},\frac{4}{\sqrt{26}}$

mRRkj 6 $I=\int_0^{\frac{\pi}{2}}\sin x\,dx$

$= \left(-\cos x\right)_0^{\pi/2} = -\left(\cos{}^{\pi}\!/_{2}-\cos 0\right)=-(0-1)=1$

mÙkj 7 v0kdYk LkEkhdj.k

$$\frac{dy}{dx} = x\log x$$

$\Rightarrow$ dy = x log x dx

integrating b.s.

$$\int dy = \int x\log x dx$$

$$y = \log x.\frac{x^2}{2} - \int \frac{1}{x}\frac{x^2}{2}dx$$

$$y = \frac{x^2}{2}\log x - \frac{1}{2}.\frac{x^2}{2} + c$$

$$y = \frac{x^2}{2}\log x - \frac{x^2}{4} + c$$

mÙkj 8

LHS	=	x + 1	
	=	(x + 1).1	identity
	=	(x+1) (x + x')	Ikjd fUk¸kEk
	=	x + (1.x')	f0kRkj.k fUk¸kEk
	=	x + x'	1.x' = x'
	=	1 R.H.S.	

mÙkj 9 bVjUkV 0¸kfDRk¸kk ¸kk TkkUkdkfj¸kk dk ,d ,Lkk LkEkg gkRkkgA fTkLkEk VYkhQkUk ¸kk d0kYk d }kjk ,d nLkj Lk TkkUkdkfj¸kk dk vknkUk&Iknkuk fd¸kk Tkk LkdRkk gA

mÙkj 10- EkkUkk A

$$= \cot^{-1}\left(\frac{1+\cos x}{\sin x}\right)$$

$$= \cot^{-1}\left(\frac{2\cos x/2}{2\sin x/2 \cos x/2}\right)$$

$$= \cot^{-1}\left(\frac{\cos x/2}{\sin x/2}\right) = \cot^{-1}\left(\cot x/2\right)$$

$$= x/2$$

mÙkj 11 fn¸kk g & LkEkkUkkRkj □ d f0kd.k ØEk'k%

$$\bar{a} = 2i + 3j + 6k$$

$$\bar{b} = 3i - 6j + 2k$$

$$\therefore \quad \bar{a}.\bar{b} \quad = \quad \bar{a}\times\bar{b} = \begin{vmatrix} i & j & j \\ 2 & 3 & 6 \\ 3 & -6 & 2 \end{vmatrix}$$

$= i(6 + 36) - j(4 - 18) + k(-12 - 9)$

$= 12i + 14j - 21k$

$$|\bar{a}\times\bar{b}| = \sqrt{1764+196+441} = \sqrt{2401}$$

$= 49$

LkEkkUkkRkj □ dk {k«kQYk ¾ $\frac{1}{2} |\bar{a}\times\bar{b}| = \frac{49}{2}$

mÙkj 12 v0kdYk LkEkhdj.k

$$(x+y+1)\frac{dy}{dx} = 1$$

$$\frac{dx}{dy} = x + y + 1$$

$$\frac{dx}{dy} - x = y + 1 \qquad \text{...........(i)}$$

Here, $P = -1$, $Q = y + 1$

I.F. $= e^{\int pdy} = e^{\int -dy} = e^{-y}$

mÙkj 13- ,d FkYk Ek dYk Xkknk dh Lk[¸kk ¾ 6 dkYkh $ 4 LkQn $ 5 gjh ¾ 15 xn

15 Xknk Ek Lk 2 Xkn fUkdkYkUk d Rkjhd ¾ $^{15}C_2$ ¾ $\frac{15.14}{2} = 15\times 7 = 105$

n(S) = 105

6 dkYkh Xknk Ek Lk 1 Xkn fUkdkYkUk d Rkjhd ¾ $^{6}C_1$ ¾ 6

5 gjh Xknk Ek Lk 1 Xkn fUkdkYkUk d Rkjhd ¾ $^{5}C_1$ ¾ 5

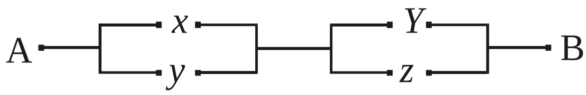
1 dkYkh vkj 1 gjh Xkn fUkdkYkUk d dYk Rkjhd ¾ $6\times 5 = 30$

n(E) = 30

lkkf¸kdRkk ¾ $\frac{n(E)}{n(S)} = \frac{30}{105} = \frac{2}{7}$

mRRkj 14   fn¸kk g QYkUk

$$f(x, y, z) = (x + y).(y + z)$$



mÙkj 15   ,LkECkYkj ,Lkk lkkXkkEk g Tkk ,LkECkYkh YkXOkTk lkkXkkEk dk Ek'khUkh Hkk"kk Ek CknYkRkk gA ¸kg fLkECkkYk dkM Hkk"kk Ek bLk lkdkj CknYkRkk g fd lkR¸kd fLkECkkfYkd fUkn'k dk ,d Ek'khUk dkM fUkn'k CkUk TkkRkk g A ,LkECkYkj nk lkdkj dk gkRkk gA (i) OkUklkkLk ,LkECkYkj (ii) V lkkLk ,LkECkYkj A

mÙkj 16

$$\Delta = \begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix}$$

$C_1 - C_2$, $C_2 - C_3$

$$= \begin{vmatrix} a & 0 & 1 \\ -b & b & 1 \\ 0 & -c & 1+c \end{vmatrix}$$

$R_2 - R_1$

$$= \begin{vmatrix} a & 0 & 1 \\ -b-a & b & 0 \\ 0 & -c & 1+c \end{vmatrix}$$

$= a\{b(1+c)+0\} - 0 + 1\{-c(-b-a) - a\}$

$= ab(1 + c) + c(a + b)$

$= ab + abc + ac + bc \quad = abc + bc + ca + ab$

$$= abc\left(1 + \frac{1}{a} + \frac{1}{b} + \frac{1}{c}\right)$$

¼vFkOkk½

$$\Delta = \begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix}$$

$C_1 + (C_2 + C_3)$

$$= \begin{vmatrix} 2a+2b+2c & a & b \\ 2a+2b+2c & b+c+2a & b \\ 2a+2b+2c & a & c+a+2b \end{vmatrix}$$

C_1 Ek Lk ¼$2a + 2b + 2c$½ dk common fudkYkk

$$= 2(a+b+c) \begin{vmatrix} 1 & a & b \\ 1 & b+c+2a & b \\ 1 & a & c+a+2b \end{vmatrix}$$

$R_1 - R_2$ and $R_2 - R_3$

$$= 2(a+b+c) \begin{vmatrix} 0 & -(a+b+c) & b \\ 0 & a+b+c & -(a+b+c) \\ 1 & a & c+a+2b \end{vmatrix}$$

$$= 2(a+b+c)\,[0 + (a+b+c)\{0 + (a+b+c)\} + 0]$$

$$= 2(a+b+c)^3$$

mÙkj 17 fn,kk g $f(x) = x^2 - 5x + 7$

Put $x = A$ in (i)

$f(A) = A^2 - 5A + 7I$

$$A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix} \text{ and } I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$A^2 = A.A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix} = \begin{bmatrix} 9-1 & 3+2 \\ -3-2 & -1+4 \end{bmatrix}$$

$$= \begin{bmatrix} 8 & 5 \\ -5 & 3 \end{bmatrix}$$

LkEkhdj.k (ii) Lk

$f(A) = A^2 - 5A + 7I$

$$= \begin{bmatrix} 8 & 5 \\ -5 & 3 \end{bmatrix} - 5\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix} + 7\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 8 & 5 \\ -5 & 3 \end{bmatrix} - \begin{bmatrix} 15 & 5 \\ -5 & 10 \end{bmatrix} + \begin{bmatrix} 7 & 0 \\ 0 & 7 \end{bmatrix}$$

$$= \begin{bmatrix} 8-15+7 & 5-5+0 \\ -5+5+0 & 3-10+7 \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} = 0$$

¼vFkOkk½

$$A = \begin{bmatrix} 2 & 3 & 1 \\ 3 & 4 & 1 \\ 3 & 7 & 2 \end{bmatrix}$$ gk Rkk

$$\therefore |A| = \begin{vmatrix} 2 & 3 & 1 \\ 3 & 4 & 1 \\ 3 & 7 & 2 \end{vmatrix}$$

$= 2\,(8 - 7) - 3\,(6 - 3) + 1\,(21 - 21)$

$= 2 - 9 + 9$

$= 2$

$\therefore$ Cofactor of A:- $A_{11} = 1$ $\quad A_{21} = 1$ $\quad A_{31} = -1$

$A_{12} = -3$ $\quad A_{22} = 1$ $\quad A_{32} = 1$

$A_{13} = 9$ $\quad A_{23} = -5$ $\quad A_{33} = -1$

$$\therefore \text{Adj } A\text{:-} \begin{bmatrix} A_{11} & A_{21} & A_{31} \\ A_{12} & A_{22} & A_{32} \\ A_{13} & A_{23} & A_{33} \end{bmatrix} = \begin{bmatrix} 1 & 1 & -1 \\ -3 & 1 & 1 \\ 9 & -5 & -1 \end{bmatrix}$$

$$\therefore A^{-1} = \frac{AdjA}{|A|} = \frac{1}{2}\begin{bmatrix} 1 & 1 & -1 \\ -3 & 1 & 1 \\ 9 & -5 & -1 \end{bmatrix}$$

mÙkj 18- nh gb j[kk, $\dfrac{x-1}{-3} = \dfrac{y-2}{2k} = \dfrac{z-3}{z}$ ....(i)

RkFkk $\dfrac{x-1}{3k} = \dfrac{y-5}{1} = \dfrac{z-6}{-5}$ ....(i) j[kk d (i) d fnd vUkIkkRk = –3, 2k, 2 $\Rightarrow a_1, b_1, c_1$

j[kk (ii) d fnd vUkIkkRk = 3k, 1, –5 $\Rightarrow a_2, b_2, c_2$

j[kk, (i) 0k (ii) IkjLIkj YkCk0kRk g Rkk IkfRkCk/k

$$a_1a_2 + b_1b_2 + c_1c_2 = 0$$

$$\Rightarrow (-3)(3k) + (2k)(1) + 2(-5) = 0$$

$$\Rightarrow -9k + 2k - 10 = 0$$

$$\Rightarrow -7k - 10 = 0$$

$$\Rightarrow -7k = 10$$

$$\Rightarrow k = \frac{-10}{7}$$

¼vFk0kk½

fn¸kk g& XkkYk dk LkEkhdj.k

$$\Rightarrow 5(x^2+y^2+z^2) + 10x - 6y + 8z + 5 = 0$$

$$\Rightarrow x^2+y^2+z^2 + 2x - \frac{6}{5}y + \frac{8}{5}z + 5 = 0$$

$$u = 1,\ v = -3/5,\ w = 4/5,\ d = 1$$

dæ ¾ $(-u, -v, -w)$ = ¼&1] $3/5$ $-4/5$)

f«kT¸kk ¾ $\sqrt{u^2+v^2+w^2-d}$

¾ $\sqrt{1+9/25+16/25-1}$

¾ $\sqrt{25/25}$ ¾ $\sqrt{1}$ ¾ 1

mÙkj 19- fn¸kk g

$$y = \tan^{-1}\sqrt{\frac{1+x}{1-x}} \quad ....(i)$$

EkkUkk $x = \cos\theta$ lehdj.k (i) l

$$y = \tan^{-1}\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \text{an}^{-1}\sqrt{\frac{2\cos^2\theta/2}{2\sin^2\theta/2}} = \tan^{-1}\sqrt{2\cot^2\theta/2}$$

$$y = \tan^{-1}\left(2\cot \theta/2\right) \quad = \tan^{-1}\left[\tan\left(\pi/2 - \theta/2\right)\right]$$

$$y = \left(\pi/2 - \theta/2\right) \quad = \pi/2 - 1/2 \cos^{-1} x$$

Diff. w.r.t. to x

$$\frac{dy}{dx} = \frac{d}{dx}\left[\pi/2 - 1/2 \cos^{-1} x\right]$$

$$= 0 - 1/2\left(-\frac{1}{\sqrt{1-x^2}}\right) = \frac{1}{2\sqrt{1-x^2}}$$

¼vFkOkk½

EkkUkk $y = \dfrac{\log x}{x}$

Diff. w.r.t. to x

$$\frac{dy}{dx} = \frac{x.\frac{1}{x} - \log x.1}{x^2} \quad = \frac{1-\log x}{x^2} \quad \text{........(ii)}$$

Again Diff. w.r.t. to x

$$\frac{d^2y}{dx^2} = \frac{x^2\left(0-\frac{1}{x}\right) - (1-\log x)2x}{\left(x^2\right)^2} = \frac{-x-2x(1-\log x)}{x^4}$$

$$= \frac{-x-2x-2x\log x}{x^4} \quad = \frac{x(-3+2\log x)}{x^4}$$

$$= \frac{-3+2\log x}{x^3} \quad \text{........(iii)}$$

Condition for Max^m or Min^m is

$$\left[\frac{dy}{dx} = 0\right] \text{ puting (ii)}$$

$$\therefore \; 0 = \frac{1-\log x}{x^2}$$

$\Rightarrow \quad 1 - \log x = 0 \Rightarrow \quad \log x = 1 \quad \Rightarrow \quad \log x = \log_e x$

$\Rightarrow \quad x = e$

$$\therefore \frac{d^3y}{dx^3} at \;\; x = e = \frac{3+2\log_e e}{e^3}$$

$$= \frac{-3+2}{e^3} = \frac{-1}{e^3} = \text{–ve}$$

$\therefore$ The given function is Max^m at $x = e$.

$\therefore$ Max^m value at $x = e$ = y = $\frac{\log_e e}{e}$ = e.

mÙkj 20- fn¸kk g $y\sqrt{1-x^2}+x\sqrt{1-y^2}=1$ ....(i)

EkkUkk $x = \sin\theta$ and $y = \sin\phi$

put in eqn. (i)

$$\sin\phi\sqrt{1-\sin^2\theta}+\sin\theta\sqrt{1-\sin^2\phi}=1$$

$$\sin\phi\sqrt{\cos^2\theta}+\sin\theta\sqrt{\cos^2\phi}=1$$

$$\sin\phi\cos\theta+\sin\theta\cos\phi=1$$

$$\sin(\theta+\phi)=1$$

$$\theta+\phi=\sin^{-1}(1)$$

$$\sin^{-1}x+\sin^{-1}y=\sin^{-1}(1)$$

diff. w. r. to x

$$\frac{1}{\sqrt{1-x^2}}+\frac{1}{\sqrt{1-y^2}}\frac{dy}{dx}=0$$

$$\frac{1}{\sqrt{1-y^2}}\frac{dy}{dx}=-\frac{1}{\sqrt{1-x^2}}$$

$$\frac{dy}{dx}=-\frac{\sqrt{1-y^2}}{\sqrt{1-x^2}} = \sqrt{\frac{1-y^2}{1-x^2}}$$

$$\therefore \quad \frac{dy}{dx}+\sqrt{\frac{1-y^2}{1-x^2}}=0$$

¼vFkok½

fn¸kk g ¸kfn $x=a(t+\sin t)$ ....(i) vkj $\quad y = a(1-\cos t)$ ....(ii)

diff (i) and (ii) w.r. to t.

$$\frac{dx}{dt} = a(1+\cos t) \qquad ....(iii)$$

and, $\quad \frac{dy}{dt} = a(0+\sin t) = a\sin t$ ....(iv)

LkEkhdj.k (iv) dk LkEkhdj.k (iii) Lk HkkXk nUk Ikj

$$\frac{dy}{dx} = \frac{a\sin t}{a(1+\cos t)} = \frac{\sin t}{(1+\cos t)} = \frac{2\sin t/2 \cos t/2}{2\cos^2 t/2}$$

$$= \frac{\sin t/2}{\cos t/2} = \tan t/2$$

mÙkj 21- fn¸kk g u ¾ 30 Ekh-@Lkd.M

ekkUkk vHkh"V LkEk¸k t RkFkk vHkh"V ÅPkkb Ik{kIk fCkn Lk h g RkFkk XkR0kh¸k g gA

IkFkEk fLFkfRk $\quad h = ut - ½gt^2$

$h = 30t - ½gt^2$ ....(i)

f}Rkh¸k fLFkfRk Ek u ¾ 0] $h = 90 - h$

$\therefore \quad 90 - h$ ¾ $0 - ½gt^2$

$90 - h$ ¾ $½gt^2$ ....(ii)

Adding (i) and (ii)

$90 = 30t$

$t = \frac{90}{30} =$ sec.

Putting the value of $t = 3$ in eqn. (i)

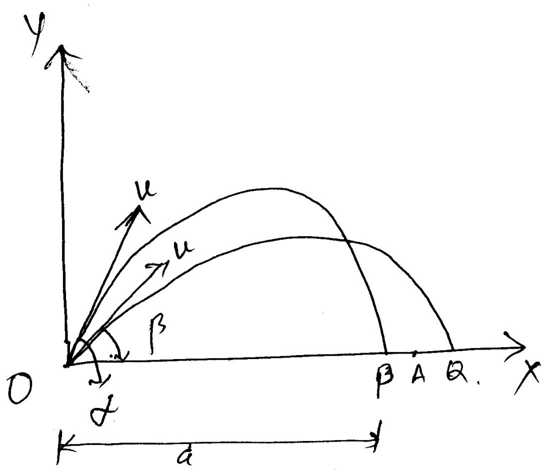
$h = 30.3 - ½g(3)^2$

$h = 90 - ½\times 9.8\times 9$

$h = 90 - 4.9\times 9$

$h = 90 - 44.1 = 45.9$ ehVj

¼vFk0kk½



$OP = a,\ OQ = b$

EkkUk fYk¸kk fd nkUkk fLFkfRk¸kk Ek O Lk lk{klk 0kXk u g RkFkk A Yk{¸k g A EkkUk fYk¸kk fd $OA=R$ RkFkk O Lk TkkUk 0kkYk {kfRkTk RkYk dk lk{kl¸k P RkFkk Q lkj vk?kkRk djRkk g TkCkfd lk{klk dk.k ØEk'k% α RkFkk β g RkCk nkUkk fLFkfRk¸kk Ek {kfRkTk lkjkLk ØEk'k% $R-a$ RkFkk $R+b$ gkXkk vRk%

$$R - a = \frac{u^2}{g}\sin 2\alpha \qquad ....(i)$$

$$R + b = \frac{u^2}{g}\sin 2\beta \qquad ....(ii)$$

LkEkhdj.k (i) dk b Lk RkFkk (ii) dk a Lk Xk.kk dj TkkMUk lkj

$$R(b-a) = \frac{u^2}{g}\left(b\sin 2\alpha + a\sin 2\beta\right)$$

$$R = \frac{u^2}{g}\left(\frac{b\sin 2\alpha + a\sin 2\beta}{a+b}\right) \qquad ....(iii)$$

EkkUkk fd Yk{¸k A lkj vk?kkRk djUk d fYk, mlk¸kDRk mRFkkUk θ g RkCk

$$R = \frac{u^2}{g}\sin 2\theta \qquad ....(iv)$$

LkEkhdj.k (iii) vkj (iv) dh RkYkUkk djUk lkj

$$\frac{u^2}{g}\sin 2\theta = \frac{u^2}{g}\left(\frac{b\sin 2\alpha + a\sin 2\beta}{a+b}\right)$$

$$\sin 2\theta = \frac{a\sin 2\beta + b\sin 2\alpha}{a+b}$$

$$\theta = \sin^{-1}\left(\frac{a\sin 2\beta + b\sin 2\alpha}{a+b}\right)$$

mRRkj 22- $I = \int \sec^3 x dx$ ....(i)

$$\sec x.\tan x - \int \sec x.\tan x.\tan x dx$$

$$\sec x.\tan x - \int \sec x.\tan^2 x.dx$$

$$\sec x.\tan x - \int \sec x.(\sec^2 x - 1).dx$$

$$\sec x.\tan x - \int (\sec^3 x - \sec x).dx$$

$$\sec x.\tan x - \int \sec^3 x dx + \int \sec x dx$$

$$I = \sec x.\tan x - \int \sec^3 x dx + \int \sec x dx$$

$$I = \sec x.\tan x - I + \log(\sec x + \tan x)dx$$

$$I + I = \sec x.\tan x + \log(\sec x + \tan x)$$

$$2I = \sec x.\tan x + \log(\sec x + \tan x)$$

$$I = \frac{1}{2}\left[\sec x.\tan x + \log(\sec x + \tan x)\right]$$

¼vFkok½

$I = \int \frac{x\sin^{-1} x}{\sqrt{1-x^2}}dx$ ....(i)

EkkUkk $x = \sin\theta$] $dx = \cos\theta d\theta$

put in (i)

$$I = \int \frac{\sin\theta \sin^{-1}(\sin\theta)}{\sqrt{1-\sin^2\theta}}.\cos\theta d\theta$$

$$I = \int \frac{\sin\theta.\theta\cos\theta}{\cos\theta}d\theta = \int \theta\sin\theta d\theta$$

$$I = \theta\int\theta\sin\theta d\theta - \left[\frac{d}{d\theta}\int\theta\sin\theta d\theta\right]d\theta$$

$$I = \theta\cos\theta + \int 1.\cos\theta d\theta$$

$$I = -\sqrt{1-\sin^2\theta} + \sin\theta$$

$$I = -\sin^{-1}x\sqrt{1-x^2} + x$$

$$I = x - \sin^{-1}x\sqrt{1-x^2}$$

mÙkj 23-

x	y	$x-\bar{x}$	$y-\bar{y}$	$(x-\bar{x})(y-\bar{y})$	$(x-\bar{x})^2$	$(y-\bar{y})^2$
65	67	&3	&2	6	9	4
66	68	&2	&1	2	4	1
67	66	&1	&3	3	1	9
68	69	0	0	0	0	0
69	72	1	3	3	1	9
70	72	2	3	6	4	9
71	69	3	0	0	0	9
$\sum x$ =476	$\sum y$ =483			$\sum(x-\bar{x})(y-\bar{y})$ = 20	$\sum(x-\bar{x})^2$ = 28	$\sum(y-\bar{y})^2$ = 32

$$\bar{x} = \frac{\sum x}{n} = \frac{476}{7} = 68$$

$$\bar{y} = \frac{\sum y}{n} = \frac{483}{7} = 69$$

$$r = \frac{\sum(x-\bar{x})(y-\bar{y})}{\sqrt{\sum(x-\bar{x})^2}\sqrt{\sum(y-\bar{y})^2}} = \frac{20}{\sqrt{28}\sqrt{32}} = \frac{20}{4\sqrt{56}}$$

$$\frac{5}{\sqrt{56}} = \frac{5}{2\sqrt{14}} = \frac{5}{2\times 3.74} = \frac{5}{7.48} = 0.67$$

¼vFkok½

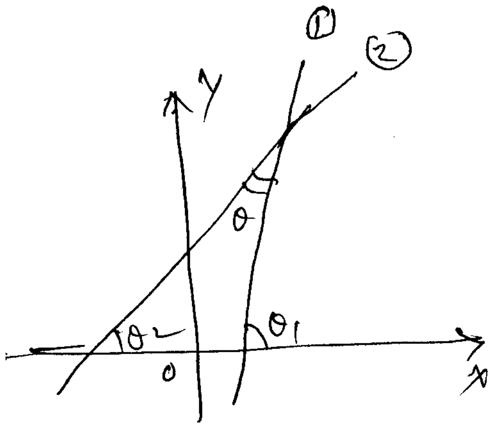
nk regression line y on x RkFkk x on y ØEk'k%

$$y - m_y = r\frac{\sigma y}{\sigma x}(x - m_x) \qquad ....(i)$$

and $\quad y - m_x = r\dfrac{\sigma x}{\sigma y}(y - m_y)$ ....(ii)

j[kk (i) dh lk0k.kRkk $\quad m_1 = r\dfrac{\sigma y}{\sigma x}$

j[kk (ii) dh lk0k.kRkk $\quad m_2 = \dfrac{\sigma y}{r\sigma x}$



EkkUkk j[kkvk d CkhPk dk dk.k θ g Rkk]

$$\tan\theta = \frac{m_2 - m_1}{1 + m_1 m_2}$$

$$\tan\theta = \frac{\dfrac{\sigma y}{r\sigma x} - r\dfrac{\sigma y}{\sigma x}}{1 + \dfrac{\sigma y}{r\sigma x} r\dfrac{\sigma y}{\sigma x}} = \frac{\dfrac{\sigma y - r^2\sigma y}{r\sigma x}}{1 + \dfrac{\sigma y^2}{\sigma x^2}} = \frac{\dfrac{\sigma y}{\sigma x}\left(\dfrac{1 - r^2}{r}\right)}{\left(\dfrac{\sigma x^2 + \sigma y^2}{\sigma x^2}\right)}$$

$$\tan\theta = \left(\frac{1 - r^2}{r}\right)\frac{\sigma y}{\sigma x} \times \frac{\sigma x^2}{\left(\sigma x^2 + \sigma y^2\right)}$$

$$\therefore \quad \left[\tan\theta = \left(\frac{1 - r^2}{r}\right)\left(\frac{\sigma x \sigma y}{\sigma x^2 + \sigma y^2}\right)\right]$$

mÙkj 24- EkkUk fYk¸kk fd P RkFkk Q CkYkk dk lkfj.kkEkh R g Rkk]

$R^2 = P^2 + Q^2 + 2PQ\cos\alpha$ l

lkFkEk fLFkfRk Ek

$$\left[(2m+1)\sqrt{P^2 + Q^2}\right]^2 = P^2 + Q^2 + 2PQ\cos\alpha$$

$$\Rightarrow \quad (2m+1)^2\left(P^2 + Q^2\right) - \left(P^2 + Q^2\right) = 2PQ\cos\alpha$$

$$\Rightarrow \quad \left[(2m+1)^2 - 1\right]\left(P^2 + Q^2\right) = 2PQ\cos\alpha$$

$$\Rightarrow \quad (4m^2 + 4m)\left(P^2 + Q^2\right) = 2PQ\cos\alpha$$

$$\Rightarrow \quad 4m(m+1)\left(P^2+Q^2\right)=2PQ\cos\alpha \qquad ....(i)$$

f}Rkh¸k fLFkfRk Ek

$$\Rightarrow \quad (2m-1)^2\left(P^2+Q^2\right)=\left(P^2+Q^2\right)+2PQ\cos\left(\frac{\pi}{2}-\alpha\right)$$

$$\Rightarrow \quad \left[(2m-1)^2-1\right]\left(P^2+Q^2\right)=2PQ\sec\alpha$$

$$\Rightarrow \quad 4m(m-1)\left(P^2+Q^2\right)=2PQ\sec\alpha \qquad ....(ii)$$

LkEkhdj.k (i) ,Ok (ii) Lk &&&&&

$$\Rightarrow \quad \frac{2PQ\sec\alpha}{2PQ\cos\alpha}=\frac{4m(m-1)\left(P^2+Q^2\right)}{4m(m+1)\left(P^2+Q^2\right)}$$

$$\Rightarrow \quad \frac{\sec\alpha}{\cos\alpha}=\frac{(m-1)}{(m+1)}$$

$$\Rightarrow \quad \tan\alpha=\frac{(m-1)}{(m+1)}$$

¼vFkOkk½

EkkUkk LkHkh cyk dk Ikfj.kkEkh CkYk R g Rkk Ikfj.kkEkh CkYk R, OX fn'kk Lk θ dk.k CkUkkRkk gA

CkYkk dk OX RkFkk OY fn'kk Ek fOk¸kkfTkRk djUk Ikj

$$R\cos\theta = p\cos 0+2p\cos 60^\circ+3\sqrt{3}p\cos 150^\circ+4p\cos 300^\circ$$

$$= \quad p(1)+2p\left(1/2\right)+3p\left(-\sqrt{3}/2\right)+4p\left(1/2\right)$$

$$= \quad p+p-9p/2+2p=-p/2 \qquad ....(i)$$

$$R\sin\theta = p\sin 0+2p\sin 60^\circ+3\sqrt{3}p\sin 150^\circ+4p\sin 300^\circ$$

$$= \quad p(0)+2p\left(\sqrt{3}/2\right)+3\sqrt{3}p\left(1/2\right)+4p\left(-\sqrt{3}/2\right)$$

$$\sqrt{3}p+3\sqrt{3}/2\; p-2\sqrt{3}p=\sqrt{3}/2\; p \qquad ....(ii)$$

LkEkhdj.k (i) Ok (ii) dk OkXk djd TkkMUk Ikj

$$R^2\cos^2\theta + R^2\sin^2\theta = {p^2}/{4} + {3}/{4}\,p^2$$

$$R^2 + p^2 \quad \Rightarrow \quad R = p$$

LkEkhdj.k (ii) dk LkEkhdj.k (i) Lk HkkXk nUk Ikj

$$\frac{R\sin\theta}{R\cos\theta} = \frac{{\sqrt{3}}/{2}\;p}{-{p}/{2}} \Rightarrow \tan\theta = -\sqrt{3} = \tan 120^{o}$$

$$\Rightarrow \; \theta = 120^{o}$$

mÙkj 25- fn¸kk g& $f(x) = e^x$

x	$y = f(x) = e^x$	
0	1	y_1
1	2.72	y_2
2	7.39	y_3
3	20.09	y_4
4	54.60	y_5

$a = 0,\ b = 4,\ n = 4,\ h = \dfrac{b-a}{n} = \dfrac{4-0}{4} = 1$

$\therefore$ Simpson rule

$$\int_0^4 e^x dx = \frac{h}{3}\left[(y_1 + y_5) + 4(y_2 + y_4) + 2(y_3)\right]$$

$$= \frac{1}{3}\left[(1 + 54.60) + 4(2.72 + 20.09) + 2(7.39)\right]$$

$$= \frac{1}{3}\left[55.60 + 4(22.81) + 14.78\right]$$

$$= \frac{1}{3}\left[55.60 + 91.24 + 14.78\right]$$

$$= \frac{1}{3}\left[161.62\right] \quad = \ 53.87$$

¼vFkOkk½

fn¸kk g&

x	$y = f(x) = e^x$	
1	2	y_1
1.5	2.4	y_2
2	2.7	y_3
2.5	2.8	y_4
3	3	y_5
3.5	2.6	y_6
4	2.1	y_7

$a = 1,\ b = 4,\ n = 6,\ h = \dfrac{b-a}{n} = \dfrac{4-1}{6} = 3/6 = 1/2$

LkEkYkCk PkRkHkTkh¸k fUk¸kEk Lk]

$$\int_1^4 f(x)dx = \frac{h}{2}\left[(y_1 + y_2) + 2(y_2 + y_3 + y_4 + y_5 + y_6\right]$$

$$= \frac{1}{2\times 2}\left[(2+2.1) + 2(2.4+2.7+2.8+3+2.6)\right]$$

$$= \frac{1}{4}\left[(4.1) + 2(13.5)\right]$$

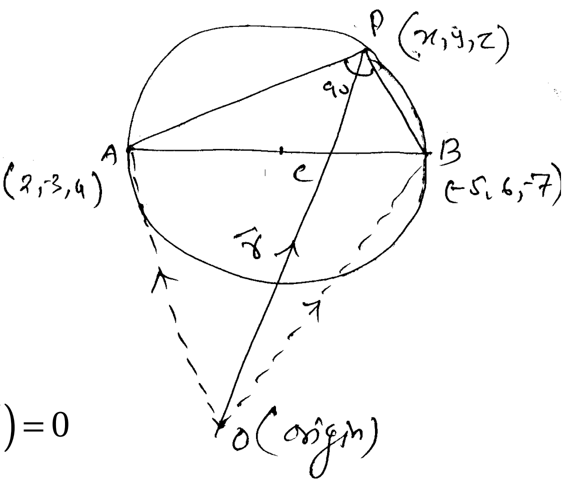
$$= \frac{1}{4}\left[4.1 + 27\right]$$

$$= \frac{31.1}{4} = 7.775$$ bdkbA

mÙkj 26 fn¸kk g AB XkkYk dk 0¸kkLk g fTkLkd

fUkn'kkd ØEk'k% ¼2]&3]4½ RkFkk

&5]6]7½ g



EkkUkk O EkYk fCkn gA O d LkkIk{k A

RkFkk B d fLFkfRk Lkfn'k ØEk'k%

$\bar{a} = 2i - 3j + 4k$

$\bar{b} = -5i + 6j - 7k]$ $\overline{OP} = \bar{r}$

XkkYk dk LkEkhdj.k $(\bar{r} - \bar{a}).(\bar{r} - \bar{b}) = 0$

$$\Rightarrow \quad \left[\bar{r}-(2i-3j+4k)\right].\left[\bar{r}-(-5i+6j-7k)\right]=0$$

$$\Rightarrow \quad \left[(\bar{r}-2i+3j-4k)\right].\left[(\bar{r}+5i-6j+7k)\right]=0 \qquad ....(i)$$

;g vHkh"V lehdj.k gA

XkkYk dk dkfRkdh¸k LkEkhdj.k]

$$(x-x_1)(x-x_2)+(y-y_1)(y-y_2)+(z-z_1)(z-z_2)=0$$

$$\Rightarrow \quad (x-2)(x+5)+(y+3_1)(y-6)+(z-4)(z+-7)=0$$

$$\Rightarrow \quad x^2+y^2+z^2+3x-3y+3z-56=0$$

LIk"VRk% bLk XkkYk dk dn $\left(-3/2, 3/2, -3/2\right)$ gA

RkFkk f«kT¸kk $\sqrt{9/4+9/4+9/4+56} = \sqrt{\frac{251}{2}}$

¼vFkOkk½

fn¸kk g nk j[kkvk d LkEkhdj.k

$$\bar{r}=(i+j)+t(2i-j+k) \qquad ....(i)$$

RkFkk $\bar{r}=(2i+j=k)+s(3i-5j+2x) \qquad ....(ii)$

LkEkhdj.k (i) Lk

$$\bar{a}_1=i+j \qquad \bar{b}_1=2i-j+k$$

LkEkhdj.k (ii) Lk

$$\bar{a}_2=2i+j-k \qquad \bar{b}_2=3i-5j+2k$$

$$\therefore \quad \bar{b}_1\times\bar{b}_2=\begin{vmatrix} i & j & k \\ 2 & -1 & 1 \\ 3 & -5 & 2 \end{vmatrix}$$

$= i(-2+5)-j(4-3)+k(-10+3)$

$= 3i-j-7k$

$$\left|\bar{b}_1\times\bar{b}_2\right| = \sqrt{9+1+49}=\sqrt{59}$$

$$\bar{a}_2-\bar{a}_1=(i+j-k)-(i+j)$$

$= i-k$

U¸kUkRkEk njh ¾ $\dfrac{\left[\bar{a}_2-\bar{a}_1,\bar{b}_1\times\bar{b}_2\right]}{\left|\bar{b}_1\times\bar{b}_2\right|}$

¾ $\dfrac{(\bar{a}_2 - \bar{a})_1, (\bar{b}_1 \times \bar{b}_2)}{\left|\bar{b}_1 \times \bar{b}_2\right|}$

¾ $\dfrac{(i-k)_1, (3i - j - 7k)}{\sqrt{59}} = \dfrac{3+0+7}{\sqrt{59}}$

¾ $\dfrac{10}{\sqrt{59}}$ mÙkj A

mÙkj 27-

$$I = \int_0^{\pi/4} \log(1+\tan x)dx \qquad \text{......(i)}$$

$$= \int_0^{\pi/4} \log\left[1+\tan\left(\frac{\pi}{4} - x\right)\right]dx$$

$$= \int_0^{\pi/4} \log\left[1+\frac{\tan\frac{\pi}{4} - \tan x}{1+\tan\frac{\pi}{4}.\tan x}\right]dx$$

$$= \int_0^{\pi/4} \log\left[1+\frac{1-\tan x}{1+\tan x}\right]dx$$

$$= \int_0^{\pi/4} \log\left[\frac{1+\tan x + 1 - \tan x}{1+\tan x}\right]dx$$

$$= \int_0^{\pi/4} \log\left[\frac{2}{1+\tan x}\right]dx$$

$$= \int_0^{\pi/4} \log 2dx - \int_0^{\pi/4} \log(1+\tan x)dx$$

$$I = \int_0^{\pi/4} \log 2dx - I \qquad \text{by (i)}$$

$$I+I = \int_0^{\pi/4} \log 2dx$$

$$2I = \log 2\int_0^{\pi/4} dx = \log 2(x)_0^{\pi/4} = \log 2\left(\pi/4 - 0\right)$$

$$2I = \pi/4 \log 2$$

$$I = \pi/8 \log 2$$

¼vFkok½

fn¸kk g¢ 0kØ dk LkEkhdj.k $x^2 = 4y$ ....(i)

RkFkk j[kk dk LkEkhdj.k $x = 4y - 2$ ....(ii)

LkEkhdj.k (i) 0k (ii) Lk

$$x^2 = x + 2$$

$$x^2 - x - 2 = 0$$

$$\Rightarrow \quad x = \frac{1 \pm \sqrt{1+8}}{2} = \frac{1 \pm 3}{2} = 2, -1$$

LkEkhdj.k (ii) Ek EkkUk j[kUk Ikj

¸kfn $x = 1$ Rkk $y = \frac{1}{4}$

¸kfn $x = 2$ Rkk $y = 1$

fCkn A RkFkk B d fUkn'kkd ØEk'k% A¼2] 1½ RkFkk $B\left(-1, \frac{1}{4}\right)$ gkXkA

vHkh"V {k«kQYk AOB

$$= \int_1^2 \left[\left(\frac{x+2}{4}\right) - \left(\frac{x^2}{4}\right)\right] dx$$

$$= \int_1^2 \left[\frac{x}{4} + \frac{1}{2} - \frac{x^2}{4}\right] dx$$

$$= \left[\frac{1}{4}\frac{x^2}{2} + \frac{x}{2} - \frac{x^3}{12}\right]_{-1}^{2}$$

$$= \left(\frac{x^2}{8} + \frac{x}{2} - \frac{x^3}{12}\right)_{-1}^{2} = \left[\left(\frac{4}{8} + \frac{2}{2} - \frac{8}{12}\right) - \left(\frac{1}{8} - \frac{1}{2} + \frac{1}{12}\right)\right]$$

$$= \left[\left(\frac{1}{2} + 1 - \frac{2}{3} - \frac{1}{8} + \frac{1}{2} - \frac{1}{12}\right) - \left(\frac{1}{8} - \frac{1}{2} - \frac{1}{12}\right)\right]$$

$$= 2 - \frac{2}{3} - \frac{1}{8} - \frac{1}{12} = \frac{48 - 16 - 3 - 2}{24} = \frac{48 - 21}{24}$$

$$= \frac{27}{24} = \frac{9}{8}$$ bdkb mÙkj

Set - B

gkbl Ldy lfVfQdV ijh{kk

High School Certificate Examination

lEiy&i'u i=

SAMPLE PAPER

fo"k; %& **(Subject)** - xf.kr le; 3 ?k.Vk **(Time- 3 Hrs)**

d{kk %& **(Class)** - ckjgoh i.kkd 100 **(M.M.)**

(Instruction) & ¼fun'k½

1- lHkh i'u gy djuk vfuok; g A

Attempt all the Question

2- i'u Øekd 01 e 10 vd fu/kkfjr g A nk dky[k.M g A [k.M ^^v** e 05 cgfodYih; i'u rFkk [k.M ^^c** e 05 fjDr LFkkuk dh ifr vfkok mfpr lc/k tkfM, A iR;d i'u d fy, 1 vd vkcfVr g A

Q. No. 01 Carries 10 Marks. There are two sub-section, Section A is Multiple choice carries 05 marks and section B is fill in the blanks or match the column carries 05 marks.

3- i'u Øekd 02 l i'u Øekd 09 rd vfr y?kmRrjh; i'u g A iR;d i'u ij 02 vd vkcfVr g A mRrj dh vf/kdre 'kCn lhek 30 'kCn A

Q. No. 2 to 09 are very short answer type question & it carries 02 marks each. Word limit is maximum 30.

4- i'u Øekd 10 l i'u Øekd 15 rd y?kmRrjh; i'u g A iR;d i'u ij 03 vd vkcfVr g A mRrj dh vf/kdre 'kCn lhek 50 'kCn A

Q. No. 10 to 15 are short answer type question & it carries 03 marks each. Word limit is maximum 50.

5- i'u Øekd 16 l i'u Øekd 21 rd y?kmRrjh; i'u g A iR;d i'u e vkrfjd fodYi g vkj iR;d i'u ij 04 vd vkcfVr g A mRrj dh vf/kdre 'kCn lhek 75 'kCn A

Q. No. 16 to 21 are short answer type question & it carries 04 marks each. Each question has internal choice. Word limit is maximum 75.

6- i'u Øekd 22 l i'u Øekd 25 rd nh?kmRrjh; i'u g A iR;d i'u e vkrfjd fodYi g vkj iR;d i'u ij 05 vd vkcfVr g A mRrj dh vf/kdre 'kCn lhek 100 'kCn A

Q. No. 22 to 25 are long answer type question & it carries 05 marks each. Each question has internal choice. Word limit is maximum 100.

7- i'u Øekd 26 l i'u Øekd 27 rd nh?kmRrjh; i'u g A iR;d i'u e vkrfjd fodYi g vkj iR;d i'u ij 06 vd vkcfVr g A mRrj dh vf/kdre 'kCn lhek 150 'kCn A

Q. No. 26 to 27 are long answer type question & it carries 06 marks each. Each question has internal choice. Word limit is maximum 150.

Ik'Uk 1¼v½ Lkgh f0kdYIk dk Pk¸kUk dhfTk, &

1- $\begin{vmatrix} x+y & y+z & z+x \\ z & x & y \\ 1 & 1 & 1 \end{vmatrix}$ dk EkkUk D¸kk gkXkk&

(a) $x+y+z$ (b) 0

(c) xyz (d) 1

2- vk0¸kg $A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 6 \end{bmatrix}$ fuEu e dkUk Lkk vk0¸kg gA

(a) RkRLkEkd vk0¸kg (b) f0kd.k vk0¸kg

(c) vfn'k vk0¸kg (d) LkEkfEkRk vk0¸kg

3- x–v{k d LkEkkUkkRkj lery dk lehdj.k D¸kk gkXkk &

(a) $ax + by + cz + d = 0$ (b) $ax + by + d = 0$

(c) $by + cz + d = 0$ (d) $by + cz + d = 0$

4- $\int\left(\sin^{-1}x+\cos^{-1}x\right)dx$ dk EkkUk gkXkk&

(a) 0 (b) $\frac{\pi x}{2}$

(c) πx (d) π

5- pj y dh pj x ij lekJ;.k dk lehdj.k g &

(a) $y = a + bx$ (b) $x = c + by$

(c) $y = 0$ (d) $x = 0$

Que 1 (A) Choose the correct answer :

1. The value of $\begin{vmatrix} x+y & y+z & z+x \\ z & x & y \\ 1 & 1 & 1 \end{vmatrix}$ is -

(a) $x+y+z$ (b) 0

(c) xyz (d) 1

2. Matrix A = $\begin{bmatrix} 2 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 6 \end{bmatrix}$ is which type of matrix -

(a) Scalar matrix (b) Diagonal matrix

(c) Identify matrix (d) square matrix

3. The equation of plane paralled to x–axis is -

(a) $ax + by + cz + d = 0$ (b) $ax + by + d = 0$

(c) $by + cz + d = 0$ (d) $by + cy + d = 0$

4. The value of $\int\left(\sin^{-1}x+\cos^{-1}x\right)dx$ is -

(a) 0 (b) $\frac{\pi x}{2}$

(c) πx (d) π

5. Equation of Regression of y on x is -

(a) $y = a + bx$ (b) $x = c + by$

(c) $y = 0$ (d) $x = 0$

¼c½ fjDRk LFkkUkk dh IkfRk djk&

1- LkjYk j[kkvk $\frac{x}{1}=\frac{y}{0}=\frac{z}{-1}$ RkFkk $\frac{x}{3}=\frac{y}{4}=\frac{z}{5}$ d CkhPk dk dk.k &&&& gkXkk A

2- a^x dk x d LkkIk{k v0kdYkUk Xk.kkd &&&&&&&&&gkXkkA

3- sin$x$ dk n0kk v0kdYkUk &&&&&&&&gkXkkA

4- Rkk'k d 52 IkRRkk Ek XkYkkEk vkUk dh Ikkf¸kdRkk &&&&&&&gkXkkA

5- ¸kfn dkb d.k IkkjfHkd 0kXk u Lk {kfRkTk Lk α dk.k CkUkkdj Ik{kfIkRk fd¸kk Tkk, Rkk mM¸kUk dkYk &&&&& gkXkk A

(B) Fill in the blanks -

1. Angle between the line $\frac{x}{1}=\frac{y}{0}=\frac{z}{-1}$ and $\frac{x}{3}=\frac{y}{4}=\frac{z}{5}$ is ....

2. Differentiate a^x with respect to x is ....

3. The n^{th} derivative of sin$x$ is ....

4. The probability of getting a Jack from a pack of 52 cards is ....

5. A particle is projected with a velocity of u at an elevation of α, then the time of flight is ....

Ik'Uk 2- fLk) dhfTk, fd $2\tan^{-1}\left(\frac{1}{3}\right)=\sin^{-1}\frac{3}{5}$.

Prove that $2\tan^{-1}\left(\frac{1}{3}\right)=\sin^{-1}\frac{3}{5}$.

Ik'Uk 3- ;fn Lkfn'k $\overline{a} = 2i + j + k$ rFkk Lkfn'k $\overline{b} = i - 4j + \lambda k$ ijLij ycor gk rk λ dk eku Kkr djk A

If $\overline{a} = 2i + j + k$ and $\overline{b} = i - 4j + \lambda k$ are perpendicular to each other, then find the value of λ.

Ik'Uk 4- nk leκUrj lerykk $2x - 2y + z + 3 = 0$ rFkk $4x - 4y + 2z + 5 = 0$ d chp dh njh Kkr djkA

Find the distance between the plane $2x - 2y + z + 3 = 0$ and $4x - 4y + 2z + 5 = 0$.

Ik'Uk 5- $\int_0^{\pi/4} \sin x dx$ dk EkkUk KkRk dhfTk,A

Evaluate $\int_0^{\pi/4} \sin x dx$

Ik'Uk 6- vOkdYk LkEkhdj.k $\frac{dy}{dx} = x\cos x$ dk eku Kkr dhfTk, A

Solve the differential equation $\frac{dy}{dx} = x\cos x$.

Ik'Uk 7- CkfYk¸kUk CkhTkXkf.kRk $[B,+,']$ d fdLkh vOk¸kOk x d fYk, fLk) dhfTk, fd $x.x = x$.

If $[B,+,']$ is Boolean Algebra and $x \in B$ then prove that $x.x = x$.

Ik'Uk 8- dEikbyj D;k g\

What is complier?

Ik'Uk 9- ¸kfn $\frac{x+1}{(x+2)(x+3)}=\frac{A}{x+2}+\frac{B}{x+3}$ g Rkk $A-B$ dk EkkUk KkRk dhfTk, A

If $\frac{x+1}{(x+2)(x+3)}=\frac{A}{x+2}+\frac{B}{x+3}$, then find the value of $A-B$.

Ik'Uk 10- LkjYkRkEk :Ik Ek 0¸kDRk dhfTk, $\tan^{-1}\left(\frac{\cos x-\sin x}{\cos x+\sin x}\right)$

Write $\tan^{-1}\left(\frac{\cos x-\sin x}{\cos x+\sin x}\right)$ in simplest form.

Ik'Uk 11- cy $\bar{F}=i+3j+2k$ dk fn;k fcUn ¼1] 2] 3½ I pydj ¼4] 2] &1½ ij igp tkrk g rk dk; dh x.kuk dhft, A

Find the work done in displacing a particle by force $\bar{F}=i+3j+2k$ from a point (1, 2, 3) to the point (4, 2, –1) along the direction of the force.

Ik'Uk 12- fuEu v0kdYk LkEkhdj.k dk gy dhfTk,&

Solve the differential equation -

$$\frac{dy}{dx}=1-x+y-xy$$

Ik'Uk 13- ,d ?kUkkdkj IkkLk dk Qddj mLkd ÅIkjh QYkd Ikj fOk"kEk vd vkUk dh Ikkf¸kdRkk KkRk dhfTk,A

A dice is thrown once. Find the probability of getting odd number.

Ik'Uk 14- CkfYk¸kUk QYkUk $f(x,y,z)=x.y+y.z$ dk fLOkfPkXk IkfjIkFk [khfPk, A

Draw switching circuit for the Boolean function $f(x,y,z)=x.y+y.z$.

Ik'Uk 15- Ipkyu i.kkyh D¸kk g\

What is an operating system?

Ik'Uk 16- ¸kfn $f(x) = x^2 - 5x + 7$ Rkk $f(\mathrm{A})$ dk EkkUk KkRk dhfTk,] TkCk $\mathrm{A} = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$

If $\mathrm{A} = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ and $f(x) = x^2 - 5x + 7$, then find he value of $f(\mathrm{A})$

¼vFkOkk½

¸kfn A = $\begin{bmatrix} 2 & 3 & 1 \\ 3 & 4 & 1 \\ 3 & 7 & 2 \end{bmatrix}$ gk Rkk A^{-1} dk EkkUk KkRk dhfTk,A

If A = $\begin{bmatrix} 2 & 3 & 1 \\ 3 & 4 & 1 \\ 3 & 7 & 2 \end{bmatrix}$, then find the value of A^{-1}.

Ik'Uk 17- ¸kfn $y = \tan^{-1}\sqrt{\frac{1+x}{1-x}}$ gk Rkk $\frac{dy}{dx}$ dk EkkUk KkRk dhfTk,

If $y = \tan^{-1}\sqrt{\frac{1+x}{1-x}}$, then find the value of $\frac{dy}{dx}$.

¼vFkOkk½

$\frac{\log x}{x}$ dk mfPPk"B EkkUk KkRk dhfTk, A

Find the maximum value of $\frac{\log x}{x}$.

Ik'Uk 18- ,d d.k 30 fEkUkV Lkd.M d 0kXk Lk ÅIkj Ik{kfIkRk fd¸kk Xk¸kk RkFkk mLkh LkEk¸k ,d nLkjk d.k mLkh m/0kk?kj j[kk Ikj 90 EkhVj dh ÅPkkb Lk UkhPk fXkjk¸kk Xk¸kk KkRk dhfTk, fd 0k dCk vkj dgk fEkYkXk A

A particle is projected upwards with a velocity of 30 m/sec. and at the same time another particle is left fall from a height of 90 m in the same vertical line. Find when and where they will meet?

¼vFkOkk½

,d d.k fTkLk Ik{kIk fCknXkRk {kfRkTk LkEkRkYk Ikj CkUk ,d Yk{¸k Ikj Ikf{kRk dj Ikf{kIRk fd¸kk TkkRkk gA Yk{¸k Lk a Ekh- bLk vkj fXkjRkk ¼nj½ fXkjRkk g TkCkfd Ik{kIk dk.k α g RkFkk Yk{¸k b ehVj bl vkj ¼nj½ fxjrk g tcfd i{ki dk.k β gA ;fn nkUkk fLFkfRk¸kk Ek Ik{kIk 0kXk ,d LkEkkUk gk Rkk fLk) dhfTk, fd mIk¸kDRk mRFkkUk (Elevation)– $\frac{1}{2}\sin^{-1}\left[\frac{a\sin 2\beta + b\sin 2\alpha}{a+b}\right]$ gkXkk A

A particle aimed at a mark which is in a horizontal plane through the point of projection, falls a feet short of it when the elevation is α and goes b feet too far when the elevation is β. Show that, if the velocity of projection be the same in all cases, the proper elevation is–

$$\frac{1}{2}\sin^{-1}\left[\frac{a\sin 2\beta + b\sin 2\alpha}{a+b}\right].$$

Ik'Uk 19- EkkUk KkRk dhfTk, &

Find the vlaue of the determinant :

$$\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix}$$

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EkkUk KkRk dhfTk, &

Find the value of the determinant :

$$\begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix}$$

Ik'Uk 20- ¸kfn $y\sqrt{1-x^2} + x\sqrt{1-y^2} = 1$ gk Rkk fLk) dhfTk, fd $\frac{dy}{dx} + \sqrt{\frac{1-y^2}{1-x^2}} = 0$

If $y\sqrt{1-x^2} + x\sqrt{1-y^2} = 1$, then prove that $\frac{dy}{dx} + \sqrt{\frac{1-y^2}{1-x^2}} = 0$.

¼vFkOkk½

¸kfn $x = a(t+\sin t)$ RkFkk $y = a(1-\cos t)$ rk $\frac{dy}{dx}$ dk eku Kkr dhf t ,A

If $x = a(t+\sin t)$ and $y = a(1-\cos t)$ then find the value of $\frac{dy}{dx}$.

Ik'Uk 21- k dk EkkUk KkRk dhfTk, ¸kfn j[kk, $\frac{x-1}{-3} = \frac{y-2}{2k} = \frac{z-3}{2}$ RkFkk

$\frac{x-1}{3k}=\frac{y-5}{1}=\frac{z-6}{-5}$ lkjLlkj YkCkOkRk gA

The line $\frac{x-1}{-3}=\frac{y-2}{2k}=\frac{z-3}{2}$ and $\frac{x-1}{3k}=\frac{y-5}{1}=\frac{z-6}{-5}$ are perpendicular to each other, then find the value of k.

¼vFkOkk½

¸kfn XkkYk dk LkEkhdj.k $5(x^2+y^2+z^2)+10x-6y+8z+5=0$ g Rkk bLkdk dæ RkFkk f«kT¸kk KkRk dhfTk, A

Find the radius and centre of the sphere $5(x^2+y^2+z^2)+10x-6y+8z+5=0$.

lk'Uk 22- dk.k θ lkj fØ¸kk dj jg nk CkYk P vkj Q dk lkfj.kkEkh CkYk $(2m+1)\sqrt{P^2+Q^2}$ d Ckjkckj g A TkCk CkYk $\left(\frac{\pi}{2}-\alpha\right)$ dk.k lkj fØ¸kk djRk g Rkk lkfj.kkEkh CkYk $(2m-1)\sqrt{P^2+Q^2}$ d Ckjkckj gkRkk g Rkk fLk) dhfTk, fd $\tan\alpha=\frac{(m-1)}{(m+1)}$

Two forces acting at angle θ are P and Q and has $(2m+1)\sqrt{P^2+Q^2}$ as resultant when they act at angle $\left(\frac{\pi}{2}-\alpha\right)$, then resultant force becomes $\left(\frac{\pi}{2}-\alpha\right)$, then prove that $\tan\alpha=\frac{(m-1)}{(m+1)}$

¼vFkOkk½

,d dk.k lkj Pkkj CkYk P, $2P$, $3\sqrt{3}P$ vkj $4P$ YkXk gA lkgYk RkFkk nljj nlj rFkk RkhLkj] RkhLkj RkFkk PkkFk CkYkk d ChPk d dk.k ØEk'k% 60º, 90º, 150º gk rk lkfj.kkEkh CkYk dk lkfjEkk.k vkj fn'kk KkRk dhfTk, A

If four forces P, $2P$, $3\sqrt{3}P$ and $4P$ act on a point such that angle between first and second is 60º, second and third is 90º, third and fourth is 150º. Then find their resultant and direction.

Ik'Uk 23- ,d 0kØ fUkEUkfYkf[kRk fCknvk Lk gkdj TkkRkk g&

x	1	1-5	2	2-5	3	3-5	4
y	2	2-4	2-7	2-8	3	2-6	2-1

bLkLk LkEkYkECk PkRkHkTkh¸k fUk¸kEk Lk 0kØ x–v{k RkFkk j[kkvk $x = 1, x = 4$ Lk f?kj g, {k«k dk {k«kQYk KkRk dhfTk, A

A curve passes through the following points :

x	1	1.5	2	2.5	3	3.5	4
y	2	2.4	2.7	2.8	3	2.6	2.1

using trapezoidal rule find the area bounded by the curve x-axis and the line $x = 1, x = 4$.

¼vFkOkk½

fn¸kk Xk¸kk g fd $e^0 = 1, e^1 = 2.72, e^2 = 7.39, e^3 = 20.09, e^4 = 54.60$ LkEkkdYk $\int_0^4 e^x dx$ dk EkkUk fLkEIkLkUk fUk¸kEk Lk KkRk dhfTk, A

Given that $e^0 = 1, e^1 = 2.72, e^2 = 7.39, e^3 = 20.09, e^4 = 54.60$. Find the value of $\int_0^4 e^x dx$ by simpson's rule.

Ik'Uk 24- $I = \int \sec^3 x dx$ dk EkkUk KkRk dhfTk, A

Evaluate : $I = \int \sec^3 x dx$

¼vFkOkk½

$I = \int \frac{x \sin^{-1} x}{\sqrt{1-x^2}} dx$ dk EkkUk KkRk dhfTk, A

Evaluate : $I = \int \frac{x \sin^{-1} x}{\sqrt{1-x^2}} dx$

Ik'Uk 25- fUkEUkfYkf[kRk Lkkj.kh Ek fIkRkk vkj Ik«k dh ÅPkkb n'kk¸kh Xk¸kh g A bLkLk Lkg&LkCk/k Xk.kkd dh Xk.kUkk dhfTk, &

fIkRkk dh ÅPkkb (x)	65	66	66	67	68	69	70
Ik«k dh ÅPkkb (y)	67	68	66	69	72	72	69

In the follwing table height of father and son are shown. Calculate the coefficient of correlation -

Height of father (x)	65	66	66	67	68	69	70
Height of son (y)	67	68	66	69	72	72	69

¼vFkok½

¸kfn nk LkEkkJ¸k.k j[kkvk (Regression lines) d CkhPk dk dk.k θ g Rkk fLk) dhfTk, fd $\tan\theta = \left(\frac{1-r^2}{r}\right)\left(\frac{\sigma x.\sigma y}{\sigma^2 x + \sigma^2 y}\right)$

If θ be gthe acute angle between the two regression lines of the variable x and y, then prove that : $\tan\theta = \left(\frac{1-r^2}{r}\right)\left(\frac{\sigma x.\sigma y}{\sigma^2 x + \sigma^2 y}\right)$

Ik'Uk 26- 0kØ $x^2 = 4y$ vkj j[kk $x = 4y - 2$ d CkhPk dk {k«kQYk KkRk dhfTk, A

Find the area enclosed between the curve $x^2 = 4y$ and $x = 4y - 2$.

¼vFkok½

EkkUk KkRk dhfTk, &

Evaluate :

$$\int_0^{\pi/4} \log(1+\tan x)dx$$

Ik'Uk 27- nk j[kkvk d CkhPk dh U¸kUkRkEk njh KkRk dhfTk, fTkUkd Lkfn'k LkEkhdj.k] $\bar{r} = (i + j) + t(2i - j + k)$ RkFkk $\bar{r} = (2i + j - k) + s(3i - 5j + 2k)$ gA

Find the shortest distance between the lines $\bar{r} = (i + j) + t(2i - j + k)$ and $\bar{r} = (2i + j - k) + s(3i - 5j + 2k)$.

¼vFkok½

mLk XkkYk dk Lkfn'k LkEkhdj.k KkRk dhfTk, fTkLkdk 0¸kkLk AB g Tkgk A vkj B d fUkn'kkd A¼2] &3] 4½ RkFkk B¼&5] 4] &7½ fn, gA XkkYk d LkEkhdj.k dk dkRkh¸k :Ik dh KkRk dhfTk, A bLkdh f«kT¸kk vkj dæ Hkh KkRk dhfTk, A

Find the vector equation of the sphere whose diameter is AB and the co-ordinate of ends *A* and *B* are (2, –3, 4) and (–5, 6, –7) respectively. Also find its equation in carterian form and find radius and centre of the sphere.

LkEIkYk lkIkj dk vkn'k lV&B

mÙkj 1- ¼v½ Lkgh fodYIk dk Pk¸kUk dhfTk,

1- (b) 0

2- (c) vfn'k vk0;g

3- (c) $by + cy + d = 0$

4- (b) $\frac{\pi x}{2}$

5- (a) $y = a + bx$

¼c½ fjDr LFkku dk Hkjk&

1- $\sin^{-1}\frac{1}{5}$

2- $a^x \log_e a$

3- $\sin\left(\frac{n\pi}{2}+\theta\right)$

4- $1/13$

5- $\frac{u^2 \sin 2\alpha}{g}$

mÙkj 2- $2\tan^{-1}\left(\frac{1}{3}\right)=\sin^{-1} 3/5$

l= $2\tan^{-1}x=\sin^{-1}\frac{2x}{1+x^2}$ l tgk $x=\frac{1}{3}$

$$2\tan^{-1}\left(\frac{1}{3}\right) = \sin^{-1}\left(\frac{2.\frac{1}{3}}{1+\left(\frac{1}{3}\right)^2}\right)$$

$$= \sin^{-1}\left(\frac{2/3}{10/9}\right) = \sin^{-1}\left(\frac{3}{5}\right)$$

mÙkj 3- fn,kk g $\bar{a} = 2i + j + k$

$$\bar{b} = i - 4j + \lambda k$$

pfd $\bar{a} \perp \bar{b}$

$\therefore \quad \bar{a}.\bar{b} = 0$

$$(2i + j + k).(i - 4j + \lambda k) = 0$$

= $2i.i + i.j + ik - 8ij - 4j.j - 4jk + 2\lambda ik + 2\lambda jk + 2\lambda kk = 0$

= $|b| = \sqrt{4+1+4} = \sqrt{9}$

$\because$ $i.i = j.j = k.k = 1$ rFkk $i.j = j.k = k.i = 0$

vr%

$$2 - 4 + \lambda = 0$$

$$-2 + \lambda = 0$$

$$\lambda = 2$$

mÙkj 4 fn,kk g & LkEkRkYk dk LkEkhdj.k

$$2x - 2y + z - 3 = 0 \qquad \text{........(i)}$$

$$4x - 4y + 2z + 5 = 0 \qquad \text{........(i)}$$

pfd LkEkRkYk (i) o (ii) lekUrj g

vr% leh (i) e $x = 0, y = o$ j[ku ij $z = -3$ ikIr gkrk g

vr% lery (i) ij dkb fcUn $p(0, 0, -3)$ ikIr gvkA

fcUn $p(0, 0, -3)$ l lery (ii) ij Mky x; yc dh yckb gh nkuk leryk d chp njh gkxhA

vr% nkuk leryk dh chp dh njh & $\dfrac{4x - 4y + 2z + 5}{\sqrt{4^2 + 4^2 + 2^2}}$

$$\frac{4\times 0 - 4\times 0 + 2\times -3 + 5}{\sqrt{16+16+4}}$$

$$\frac{-6+5}{\sqrt{36}} = \frac{-1}{6}$$

mRRkj 5 $I = \int_0^{\frac{\pi}{4}} \sin x dx$

= $(-\cos x)_0^{\pi/4}$

$$= \quad -\left(\cos \pi/4 - \cos 0\right) = -(\cos 45^{o} - \cos 0)$$

$$= \quad -\left(1/\sqrt{2} - 1 \right) = -\left(1 - \sqrt{2}/2 \right) = \sqrt{2} - 1/\sqrt{2}$$

mÙkj 6 v0kdYk LkEkhdj.k

$$\frac{dy}{dx} = x\cos x$$

$\Rightarrow$ dy = x cos x dx

integrating b.s.

$$\int dy = \int x\cos x dx + c$$

$$y = x\int \cos x dx - \int \frac{d}{dx} x.\int \cos x dx + c$$

$$y = x.\sin x - \int 1.\sin x dx + c$$

$$y = x.\sin x - (-\cos x) + c$$

$$y = x.\sin x + \cos x + c$$

mÙkj 7 CkfYk¸kUk CkhTkXkf.kRk $[B,+,']$ d fdLkh vOk¸kOk x d fYk,

$\Rightarrow$ x .x = x.x + 0

= x.x +x. x'

= x (x+x')

= x.1 ($\because$ x + x' = 1`)

= x

x.x = x

mÙkj 8 ;g ,d Hkk"kk vuoknd g tk ijk ikxke ,d ckj i<r g ,o xyfr ;k jfgr gkU ij mI e'khu Hkk"kk d dkM e cnyr g vFkkr fdlh mPp Hkk"kk ikxke dk pd djr g ,o pd dju d i'pkr e'khuh Hkk"kk e cnyr dk; djr gA ;g rho xfr e vuokn djr gA tI dkcky dEikbyj] ikLdy dEikbyj] lh dEikbyj vkfnA

mÙkj 9- $\frac{x+1}{(x+2)(x+3)} = \frac{A}{x+2} + \frac{B}{x+3}$ ....(i)

$\Rightarrow$ $x + 1 = A(x+3) + B(x+2)$ ....(ii)

;fn $x = -3$

x dk eku lehs (ii) e j[ku ij

$-3+1 = B(-3+2) + 0$

$-1 = -B \quad \Rightarrow \quad B = 1$

;fn $x = -2$

x dk eku lehs (ii) e j[ku ij

$-2+1 = 0 + A(-2+3)$

$-1 = A \quad \Rightarrow \quad A = -1$

$\therefore \quad A - B = -1 - 1 = -2$

mÙkj 10- fn;k x;k g

$$= \tan^{-1}\left(\frac{\cos x - \sin x}{\cos x + \sin x}\right)$$

$a\cos x$ dk v'k o gj e Hkkx nu ij

$$= \tan^{-1}\left(\frac{1-\tan x}{1+\tan x}\right)$$

$$= \tan^{-1}\left(\frac{\tan\frac{\pi}{4} - \tan x}{\tan\frac{\pi}{4} + \tan x}\right) \qquad \left(\because 1 = \tan\frac{\pi}{4}\right)$$

$$= \tan^{-1}\tan\left(\pi/4 - x\right) \qquad \because \text{l} = \tan(A-B) = \frac{\tan A - \tan B}{1 - \tan A \tan B}$$

$$= \left(\frac{\pi}{4} - x\right)$$

mÙkj 11 cy $\bar{F} = i + 3j + 2k$

fn; x; fcUnvk d fun'kkd ¼1] 2] 3½ ,o ¼4] 2] &1½ gA

vr% foLFkkiu $\bar{d} = (4i + 2j - k) - (i + 2j + 3k)$

$\bar{d} = 3i + 0j - 4k$

vr% fd;k x;k dk; $w = \bar{F}.\bar{d}$

$w = (i + 3j + 2k).(3i + 0j + 3k)$

$w = 3.i.i + 9.i.j + 6.i.k + 0.i.j + 0.i.j + 0.j.k. -4.i.k - 12.j.k. -8.k.k$

$\because \quad i.i = j.j = k.k = 1$ rFkk $i.j = j.k = k.i = 0$

$w = 3 - 8 = -5$

mÙkj 12 v0kdYk LkEkhdj.k

$$\frac{dy}{dx} = 1 - x + y - xy$$

$$\frac{dy}{dx} = (1-x) + (1-x)y$$

$$\frac{dy}{dx} = (1+y)(1-x)$$

$$\frac{1}{(1+y)}dy = (1-x)dx$$

$$\int \frac{1}{(1+y)}dy = \int (1-x)dx$$

$$\log(1+y) = x - \frac{x^2}{2} + c$$

mÙkj 13- ikl e 6 vd gkr gA

vr% ifrn'k lef"V S = {1, 2, 3, 4, 5, 6}

n(S) = 6

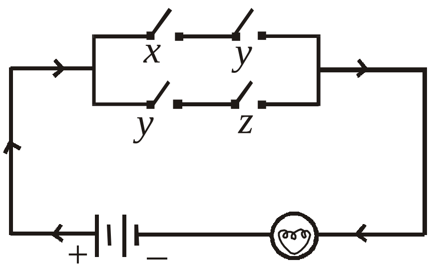
,o b l e l fo"ke vd = {1, 3, 5}

n(E) = 3

lkkf¸kdRkk ¾ $\frac{n(E)}{n(S)} = \frac{3}{6} = \frac{1}{2}$

mRRkj 14 fn¸kk g QYkUk

$$f = x.y + y.z$$



mÙkj 15 lpkyu i.kkyh dk pykus d lkFk&lkFk dEI;Vj d fofHkUu Hkkxk dk fu;f=r Hkh djrh gA dEI;Vj d fofHkUu fMokblk e lEUo; LFkkfir djr g, ;tj ¼mi;kxdrk eu";½ ,o dEI;Vj e'khu d chp lc/k LFkkfir dju e ;g lk¶Vo;j lgk;d fl) gkxkA

mÙkj 16 fn¸kk g $f(x) = x^2 - 5x + 7$

Put $x = A$ in (i)

$f(A) = A^2 - 5A + 7I$

$$A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix} \text{ and } I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$A^2 = A.A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix} = \begin{bmatrix} 9-1 & 3+2 \\ -3-2 & -1+4 \end{bmatrix}$$

$$= \begin{bmatrix} 8 & 5 \\ -5 & 3 \end{bmatrix}$$

LkEkhdj.k (ii) Lk

$$f(A) = A^2 - 5A + 7I$$

$$= \begin{bmatrix} 8 & 5 \\ -5 & 3 \end{bmatrix} - 5\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix} + 7\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 8 & 5 \\ -5 & 3 \end{bmatrix} - \begin{bmatrix} 15 & 5 \\ -5 & 10 \end{bmatrix} + \begin{bmatrix} 7 & 0 \\ 0 & 7 \end{bmatrix}$$

$$= \begin{bmatrix} 8-15+7 & 5-5+0 \\ -5+5+0 & 3-10+7 \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} = 0$$

¼vFk0kk½

$$A = \begin{bmatrix} 2 & 3 & 1 \\ 3 & 4 & 1 \\ 3 & 7 & 2 \end{bmatrix} \text{ gk Rkk}$$

$$\therefore |A| = \begin{vmatrix} 2 & 3 & 1 \\ 3 & 4 & 1 \\ 3 & 7 & 2 \end{vmatrix}$$

$= 2\ (8 - 7) - 3\ (6 - 3) + 1\ (21 - 21)$
$= 2 - 9 + 9$
$= 2$

$\therefore$ Cofactor of A:- $A_{11} = 1 \quad A_{21} = 1 \quad A_{31} = -1$
$A_{12} = -3 \quad A_{22} = 1 \quad A_{32} = 1$
$A_{13} = 9 \quad A_{23} = -5 \quad A_{33} = -1$

$$\therefore \text{Adj } A\text{:-} \begin{bmatrix} A_{11} & A_{21} & A_{31} \\ A_{12} & A_{22} & A_{32} \\ A_{13} & A_{23} & A_{33} \end{bmatrix} = \begin{bmatrix} 1 & 1 & -1 \\ -3 & 1 & 1 \\ 9 & -5 & -1 \end{bmatrix}$$

$$\therefore A^{-1} = \frac{AdjA}{|A|} = \frac{1}{2}\begin{bmatrix} 1 & 1 & -1 \\ -3 & 1 & 1 \\ 9 & -5 & -1 \end{bmatrix}$$

mÙkj 17- fn¸kk g

$$y = \tan^{-1}\sqrt{\frac{1+x}{1-x}} \quad ....(i)$$

EkkUkk $x = \cos\theta$ lehdj.k (i) l

$$y = \tan^{-1}\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = an^{-1}\sqrt{\frac{2\cos^2\theta/2}{2\sin^2\theta/2}} = \tan^{-1}\sqrt{2\cot^2\theta/2}$$

$$y = \tan^{-1}\left(2\cot\theta/2\right) = \tan^{-1}\left[\tan\left(\pi/2 - \theta/2\right)\right]$$

$$y = \left(\pi/2 - \theta/2\right) = \pi/2 - 1/2\cos^{-1}x$$

Diff. w.r.t. to x

$$\frac{dy}{dx} = \frac{d}{dx}\left[\pi/2 - 1/2\cos^{-1}x\right]$$

$$= 0 - 1/2\left(-\frac{1}{\sqrt{1-x^2}}\right) = \frac{1}{2\sqrt{1-x^2}}$$

¼vFkok½

EkkUkk $y = \dfrac{\log x}{x}$

Diff. w.r.t. to x

$$\frac{dy}{dx} = \frac{x.\frac{1}{x} - \log x.1}{x^2} = \frac{1 - \log x}{x^2} \quad ....(ii)$$

Again Diff. w.r.t. to x

$$\frac{d^2y}{dx^2} = \frac{x^2\left(0 - \frac{1}{x}\right) - (1 - \log x)2x}{\left(x^2\right)^2} = \frac{-x - 2x(1 - \log x)}{x^4}$$

$$= \frac{-x - 2x - 2x\log x}{x^4} = \frac{x(-3 + 2\log x)}{x^4}$$

$$= \frac{-3 + 2\log x}{x^3} \quad ....(iii)$$

Condition for Max^m or Min^m is

$$\left[\frac{dy}{dx} = 0\right] \text{ puting (ii)}$$

$$\therefore \; 0 = \frac{1 - \log x}{x^2}$$

$\Rightarrow$ $1 - \log x = 0$ $\Rightarrow$ $\log x = 1$ $\Rightarrow$ $\log x = \log_e x$

$\Rightarrow$ $x = e$

$$\therefore \; \frac{d^3y}{dx^3} at \;\; x = e = \frac{3 + 2\log_e e}{e^3}$$

$$= \frac{-3 + 2}{e^3} = \frac{-1}{e^3} = -\text{ve}$$

$\therefore$ The given function is Max^m at $x = e$.

$\therefore$ Max^m value at $x = e$ = y = $\frac{\log_e e}{e}$ = e.

mÙkj 18- fn¸kk g u ¾ 30 Ekh-@Lkd.M

ekkUkk vHkh"V LkEk¸k t RkFkk vHkh"V ÅPkkb Ik{kIk fCkn Lk h g RkFkk XkR0kh¸k g gA

IkFkEk fLFkfRk $h = ut - \frac{1}{2}gt^2$

$$h = 30t - \frac{1}{2}gt^2 \quad ....(i)$$

f}Rkh¸k fLFkfRk Ek u ¾ 0] $h = 90 - h$

∴ $90 - h$ ¾ $0 - \frac{1}{2}gt^2$

$90 - h$ ¾ $\frac{1}{2}gt^2$ ....(ii)

Adding (i) and (ii)

$90 = 30t$

$$t = \frac{90}{30} = \text{sec.}$$

Putting the value of $t = 3$ in eqn. (i)

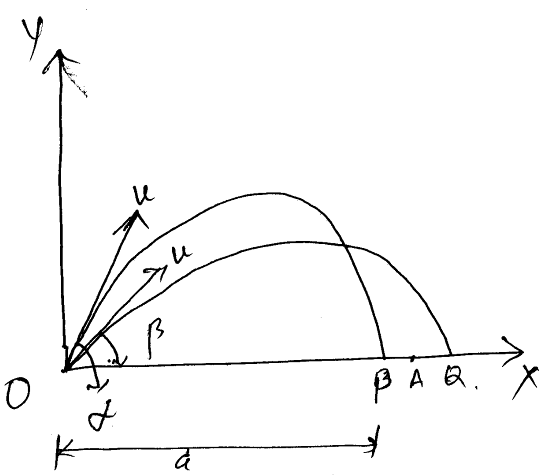
$h = 30.3 - \frac{1}{2}g(3)^2$

$h = 90 - \frac{1}{2}\times 9.8\times 9$

$h = 90 - 4.9\times 9$

$h = 90 - 44.1 = 45.9$ ehVj

¼vFkOkk½



$OP = a$, $OQ = b$

EkkUk fYk¸kk fd nkUkk fLFkfRk¸kk Ek O Lk Ik{kIk 0kXk u g RkFkk A Yk{¸k g A EkkUk fYk¸kk fd $OA=R$ RkFkk O Lk TkkUk 0kkYk {kfRkTk RkYk dk Ik{kI¸k P RkFkk Q Ikj vk?kkRk djRkk g TkCkfd Ik{kIk dk.k ØEk'k% α RkFkk β g RkCk nkUkk fLFkfRk¸kk Ek {kfRkTk IkjkLk ØEk'k% $R - a$ RkFkk $R + b$ gkXkk vRk%

$$R - a = \frac{u^2}{g}\sin 2\alpha \quad \text{...........(i)}$$

$$R + b = \frac{u^2}{g}\sin 2\beta \quad \text{...........(ii)}$$

LkEkhdj.k (i) dk b Lk RkFkk (ii) dk a Lk Xk.kk dj TkkMUk Ikj

$$R(b - a) = \frac{u^2}{g}\left(b\sin 2\alpha + a\sin 2\beta\right)$$

$$R = \frac{u^2}{g}\left(\frac{b\sin 2\alpha + a\sin 2\beta}{a+b}\right) \quad \text{...........(iii)}$$

EkkUkk fd Yk{¸k A Ikj vk?kkRk djUk d fYk, mIk¸kDRk mRFkkUk θ g RkCk

$$R = \frac{u^2}{g}\sin 2\theta \quad \text{...........(iv)}$$

LkEkhdj.k (iii) vkj (iv) dh RkYkUkk djUk Ikj

$$\frac{u^2}{g}\sin 2\theta = \frac{u^2}{g}\left(\frac{b\sin 2\alpha + a\sin 2\beta}{a+b}\right)$$

$$\sin 2\theta = \frac{a\sin 2\beta + b\sin 2\alpha}{a+b}$$

$$\theta = \sin^{-1}\left(\frac{a\sin 2\beta + b\sin 2\alpha}{a+b}\right)$$

mÙkj 19

$$\Delta = \begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix}$$

$$C_1 - C_2 \; , \; C_2 - C_3$$

$$= \begin{vmatrix} a & 0 & 1 \\ -b & b & 1 \\ 0 & -c & 1+c \end{vmatrix}$$

$$R_2 - R_1$$

$$= \begin{vmatrix} a & 0 & 1 \\ -b-a & b & 0 \\ 0 & -c & 1+c \end{vmatrix}$$

$= a\{b(1+c)+0\} - 0 + 1\{-c(-b-a) - a\}$

$= ab(1 + c) + c(a + b)$

$= ab + abc + ac + bc \quad = abc + bc + ca + ab$

$$= abc\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$$

¼vFkok½

$$\Delta = \begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix}$$

$C_1 + (C_2 + C_3)$

$$= \begin{vmatrix} 2a+2b+2c & a & b \\ 2a+2b+2c & b+c+2a & b \\ 2a+2b+2c & a & c+a+2b \end{vmatrix}$$

C_1 Ek Lk ¼$2a + 2b + 2c$½ dk common fudkYkk

$$= 2¼a + b + c½ \begin{vmatrix} 1 & a & b \\ 1 & b+c+2a & b \\ 1 & a & c+a+2b \end{vmatrix}$$

$R_1 - R_2$ and $R_2 - R_3$

$$= 2¼a + b + c½ \begin{vmatrix} 0 & -(a+b+c) & b \\ 0 & a+b+c & -(a+b+c) \\ 1 & a & c+a+2b \end{vmatrix}$$

= 2¼$a + b + c$½ [0 + ¼$a + b + c$½{ 0 + $(a + b + c)$} + 0]

= 2¼$a + b + c$½^3

mÙkj 20- fn;k g $y\sqrt{1-x^2} + x\sqrt{1-y^2} = 1$ ....(i)

ekuk $x = \sin\theta$ and $y = \sin\phi$

put in eqn. (i)

$$\sin\phi\sqrt{1-\sin^2\theta} + \sin\theta\sqrt{1-\sin^2\phi} = 1$$

$$\sin\phi\sqrt{\cos^2\theta} + \sin\theta\sqrt{\cos^2\phi} = 1$$

$$\sin\phi\cos\theta+\sin\theta\cos\phi=1$$

$$\sin(\theta+\phi)=1$$

$$\theta+\phi=\sin^{-1}(1)$$

$$\sin^{-1}x+\sin^{-1}y=\sin^{-1}(1)$$

diff. w. r. to x

$$\frac{1}{\sqrt{1-x^2}}+\frac{1}{\sqrt{1-y^2}}\frac{dy}{dx}=0$$

$$\frac{1}{\sqrt{1-y^2}}\frac{dy}{dx}=-\frac{1}{\sqrt{1-x^2}}$$

$$\frac{dy}{dx}=-\frac{\sqrt{1-y^2}}{\sqrt{1-x^2}} \quad = \sqrt{\frac{1-y^2}{1-x^2}}$$

$$\therefore \qquad \frac{dy}{dx}+\sqrt{\frac{1-y^2}{1-x^2}}=0$$

¼vFkok½

fn¸kk g ¸kfn $x=a(t+\sin t)$ ....(i)

vkj $y=a(1-\cos t)$ ....(ii)

diff (i) and (ii) w.r. to t.

$$\frac{dx}{dt}=a(1+\cos t) \qquad ....(iii)$$

and, $\frac{dy}{dt}=a(0+\sin t)=a\sin t$ ....(iv)

LkkEkhdj.k (iv) dk LkkEkhdj.k (iii) Lk HkkXk nUk Ikj

$$\frac{dy}{dx}=\frac{a\sin t}{a(1+\cos t)} = \frac{\sin t}{(1+\cos t)} = \frac{2\sin{}^{t}\!/_{2}\cos{}^{t}\!/_{2}}{2\cos^2{}^{t}\!/_{2}}$$

$$= \frac{\sin{}^{t}\!/_{2}}{\cos{}^{t}\!/_{2}} = \tan{}^{t}\!/_{2}$$

mÙkj 21- nh gb j[kk, $\frac{x-1}{-3}=\frac{y-2}{2k}=\frac{z-3}{z}$ ....(i)

RkFkk $\frac{x-1}{3k}=\frac{y-5}{1}=\frac{z-6}{-5}$ ....(i)

j[kk d (i) d fnd vUkIkkRk = $-3, 2k, 2 \Rightarrow a_1, b_1, c_1$

j[kk (ii) d fnd vUkIkkRk = $3k, 1, -5 \Rightarrow a_2, b_2, c_2$

j[kk, (i) 0k (ii) IkjLIkj YkCk0kRk g Rkk IkfRkCk/k

$$a_1a_2 + b_1b_2 + c_1c_2 = 0$$

$$\Rightarrow (-3)(3k) + (2k)(1) + 2(-5) = 0$$

$$\Rightarrow -9k + 2k - 10 = 0$$

$$\Rightarrow -7k - 10 = 0$$

$$\Rightarrow -7k = 10$$

$$\Rightarrow k = \frac{-10}{7}$$

¼vFk0kk½

fn¸kk g& XkkYk dk LkEkhdj.k

$$\Rightarrow 5(x^2+y^2+z^2) + 10x - 6y + 8z + 5 = 0$$

$$\Rightarrow x^2+y^2+z^2 + 2x - \frac{6}{5}y + \frac{8}{5}z + 5 = 0$$

$$u = 1,\ v = -\tfrac{3}{5},\ w = \tfrac{4}{5},\ d = 1$$

dæ ¾ $(-u, -v, -w)$ = ¼&1] $\tfrac{3}{5} - \tfrac{4}{5}$)

f«kT¸kk ¾ $\sqrt{u^2+v^2+w^2-d}$

¾ $\sqrt{1+\tfrac{9}{25}+\tfrac{16}{25}-1}$

¾ $\sqrt{\tfrac{25}{25}}$ ¾ $\sqrt{1}$ ¾ 1

mÙkj 22- EkkUk fYk¸kk fd P RkFkk Q CkYkk dk Ikfj.kkEkh R g Rkk]

$$R^2 = P^2 + Q^2 + 2PQ\cos\alpha$$ I

IkFkEk fLFkfRk Ek

$$\left[(2m+1)\sqrt{P^2+Q^2}\right]^2 = P^2 + Q^2 + 2PQ\cos\alpha$$

$$\Rightarrow (2m+1)^2\left(P^2+Q^2\right) - \left(P^2+Q^2\right) = 2PQ\cos\alpha$$

$$\Rightarrow \quad \left[(2m+1)^2-1\right]\left(P^2+Q^2\right)=2PQ\cos\alpha$$

$$\Rightarrow \quad (4m^2+4m)\left(P^2+Q^2\right)=2PQ\cos\alpha$$

$$\Rightarrow \quad 4m(m+1)\left(P^2+Q^2\right)=2PQ\cos\alpha \qquad ....(i)$$

f}Rkh¸k fLFkfRk Ek

$$\Rightarrow \quad (2m-1)^2\left(P^2+Q^2\right)=\left(P^2+Q^2\right)+2PQ\cos\left(\frac{\pi}{2}-\alpha\right)$$

$$\Rightarrow \quad \left[(2m-1)^2-1\right]\left(P^2+Q^2\right)=2PQ\sec\alpha$$

$$\Rightarrow \quad 4m(m-1)\left(P^2+Q^2\right)=2PQ\sec\alpha \qquad ....(ii)$$

LkEkhdj.k (i) ,Ok (ii) Lk &&&&&

$$\Rightarrow \quad \frac{2PQ\sec\alpha}{2PQ\cos\alpha}=\frac{4m(m-1)\left(P^2+Q^2\right)}{4m(m+1)\left(P^2+Q^2\right)}$$

$$\Rightarrow \quad \frac{\sec\alpha}{\cos\alpha}=\frac{(m-1)}{(m+1)}$$

$$\Rightarrow \quad \tan\alpha=\frac{(m-1)}{(m+1)}$$

¼vFkOkk½

EkkUkk LkHkh cyk dk Ikfj.kkEkh CkYk R g Rkk Ikfj.kkEkh CkYk R, OX fn'kk Lk θ dk.k CkUkkRkk gA

CkYkk dk OX RkFkk OY fn'kk Ek f0k¸kkfTkRk djUk Ikj

$$R\cos\theta = p\cos 0+2p\cos 60^{o}+3\sqrt{3}p\cos 150^{o}+4p\cos 300^{o}$$

$$= \quad p(1)+2p\left(1/2\right)+3p\left(-\sqrt{3}/2\right)+4p\left(1/2\right)$$

$$= \quad p+p-9p/2+2p=-p/2 \qquad ....(i)$$

$$R\sin\theta = p\sin 0+2p\sin 60^{o}+3\sqrt{3}p\sin 150^{o}+4p\sin 300^{o}$$

$$= \quad p(0)+2p\left(\sqrt{3}/2\right)+3\sqrt{3}p\left(1/2\right)+4p\left(-\sqrt{3}/2\right)$$

$$\sqrt{3}p + \frac{3\sqrt{3}}{2}p - 2\sqrt{3}p = \frac{\sqrt{3}}{2}p \qquad ....(ii)$$

LkEkhdj.k (i) Ok (ii) dk OkXk djd TkkMUk Ikj

$$R^2\cos^2\theta + R^2\sin^2\theta = \frac{p^2}{4} + \frac{3}{4}p^2$$

$$R^2 + p^2 \quad \Rightarrow \quad R = p$$

LkEkhdj.k (ii) dk LkEkhdj.k (i) Lk HkkXk nUk Ikj

$$\frac{R\sin\theta}{R\cos\theta} = \frac{\frac{\sqrt{3}}{2}p}{-\frac{p}{2}} \Rightarrow \tan\theta = -\sqrt{3} = \tan 120^{o}$$

$$\Rightarrow \theta = 120^{o}$$

mRrj 23 fn¸kk g&

x	$y = f(x) = e^x$	
1	2	y_1
1.5	2.4	y_2
2	2.7	y_3
2.5	2.8	y_4
3	3	y_5
3.5	2.6	y_6
4	2.1	y_7

a = 1, b = 4, n = 6, h = $\frac{b-a}{n} = \frac{4-1}{6} = \frac{3}{6} = \frac{1}{2}$

LkEkYkCk PkRkHkTkh¸k fUk¸kEk Lk]

$$\int_1^4 f(x)dx = \frac{h}{2}\left[(y_1 + y_2) + 2(y_2 + y_3 + y_4 + y_5 + y_6\right]$$

$$= \frac{1}{2\times 2}\left[(2 + 2.1) + 2(2.4 + 2.7 + 2.8 + 3 + 2.6)\right]$$

$$= \frac{1}{4}\left[(4.1) + 2(13.5)\right]$$

$$= \frac{1}{4}\left[4.1 + 27\right]$$

$$= \frac{31.1}{4} = 7.775 \text{ bdkbA}$$

¼vFkok½

fn¸kk g& $f(x) = e^x$

x	$y = f(x) = e^x$	
0	1	y_1
1	2.72	y_2
2	7.39	y_3
3	20.09	y_4
4	54.60	y_5

$a = 0,\ b = 4,\ n = 4,\ h = \frac{b-a}{n} = \frac{4-0}{4} = 1$

$\therefore$ Simpson rule

$$\int_0^4 e^x dx = \frac{h}{3}\left[(y_1 + y_5) + 4(y_2 + y_4) + 2(y_3)\right]$$

$$= \frac{1}{3}\left[(1 + 54.60) + 4(2.72 + 20.09) + 2(7.39)\right]$$

$$= \frac{1}{3}\left[55.60 + 4(22.81) + 14.78\right]$$

$$= \frac{1}{3}\left[55.60 + 91.24 + 14.78\right]$$

$$= \frac{1}{3}\left[161.62\right] = 53.87$$

mRRkj 24- $I = \int \sec^3 x dx$ ....(i)

$$\sec x.\tan x - \int \sec x.\tan x.\tan x dx$$
$$\sec x.\tan x - \int \sec x.\tan^2 x.dx$$
$$\sec x.\tan x - \int \sec x.(\sec^2 x - 1).dx$$
$$\sec x.\tan x - \int (\sec^3 x - \sec x).dx$$
$$\sec x.\tan x - \int \sec^3 x dx + \int \sec x dx$$
$$I = \sec x.\tan x - \int \sec^3 x dx + \int \sec x dx$$
$$I = \sec x.\tan x - I + \log(\sec x + \tan x) dx$$
$$I + I = \sec x.\tan x + \log(\sec x + \tan x)$$
$$2I = \sec x.\tan x + \log(\sec x + \tan x)$$
$$I = \frac{1}{2}\left[\sec x.\tan x + \log(\sec x + \tan x)\right]$$

¼vFkok½

$I = \int \frac{x \sin^{-1} x}{\sqrt{1-x^2}} dx$ ....(i)

EkkUkk $x = \sin\theta]$ $dx = \cos\theta d\theta$

put in (i)

$$I = \int \frac{\sin\theta \sin^{-1}(\sin\theta)}{\sqrt{1-\sin^2\theta}}.\cos\theta d\theta$$
$$I = \int \frac{\sin\theta.\theta\cos\theta}{\cos\theta} d\theta = \int \theta \sin\theta d\theta$$
$$I = \theta \int \theta \sin\theta d\theta - \left[\frac{d}{d\theta} \int \theta \sin\theta d\theta\right] d\theta$$
$$I = \theta \cos\theta + \int 1.\cos\theta d\theta$$
$$I = -\sqrt{1-\sin^2\theta} + \sin\theta$$
$$I = -\sin^{-1} x \sqrt{1-x^2} + x$$

$I = \quad x - \sin^{-1} x\sqrt{1-x^2}$

mÙkj 25-

x	y	$x-\overline{x}$	$y-\overline{y}$	$(x-\overline{x})(y-\overline{y})$	$(x-\overline{x})^2$	$(y-\overline{y})^2$
65	67	&3	&2	6	9	4
66	68	&2	&1	2	4	1
67	66	&1	&3	3	1	9
68	69	0	0	0	0	0
69	72	1	3	3	1	9
70	72	2	3	6	4	9
71	69	3	0	0	0	9
$\sum x$ =476	$\sum y$ =483			$\sum (x-\overline{x})(y-\overline{y})$ = 20	$\sum (x-\overline{x})^2$ = 28	$\sum (y-\overline{y})^2$ = 32

$$\overline{x} = \frac{\sum x}{n} = \frac{476}{7} = 68$$

$$\overline{y} = \frac{\sum y}{n} = \frac{483}{7} = 69$$

$$r = \frac{\sum (x-\overline{x})(y-\overline{y})}{\sqrt{\sum (x-\overline{x})^2}\sqrt{\sum (y-\overline{y})^2}} = \frac{20}{\sqrt{28}\sqrt{32}} = \frac{20}{4\sqrt{56}}$$

$$\frac{5}{\sqrt{56}} = \frac{5}{2\sqrt{14}} = \frac{5}{2\times 3.74} = \frac{5}{7.48} = 0.67$$

¼vFkok½

nk regression line y on x RkFkk x on y ØEk'k%

$$y - m_y = r\frac{\sigma y}{\sigma x}(x - m_x) \qquad ....(i)$$

and $$y - m_x = r\frac{\sigma x}{\sigma y}(y - m_y) \qquad ....(ii)$$

j[kk (i) dh Ik0k.kRkk $m_1 = r\frac{\sigma y}{\sigma x}$

j[kk (ii) dh Ik0k.kRkk $m_2 = \frac{\sigma y}{r\sigma x}$

EkkUkk j[kkvk d CkhPk dk dk.k θ g Rkk]

$$\tan\theta = \frac{m_2 - m_1}{1 + m_1 m_2}$$

$$\tan\theta = \frac{\frac{\sigma y}{r\sigma x} - r\frac{\sigma y}{\sigma x}}{1 + \frac{\sigma y}{r\sigma x} r \frac{\sigma y}{\sigma x}} = \frac{\frac{\sigma y - r^2 \sigma y}{r\sigma x}}{1 + \frac{\sigma y^2}{\sigma x^2}} = \frac{\frac{\sigma y}{\sigma x}\left(\frac{1 - r^2}{r}\right)}{\left(\frac{\sigma x^2 + \sigma y^2}{\sigma x^2}\right)}$$

$$\tan\theta = \left(\frac{1 - r^2}{r}\right)\frac{\sigma y}{\sigma x} \times \frac{\sigma x^2}{\left(\sigma x^2 + \sigma y^2\right)}$$

$$\therefore \left[\tan\theta = \left(\frac{1 - r^2}{r}\right)\left(\frac{\sigma x \sigma y}{\sigma x^2 + \sigma y^2}\right)\right]$$

mÙkj 26 fn¸kk g 0kØ dk LkEkhdj.k $x^2 = 4y$ ....(i)

RkFkk j[kk dk LkEkhdj.k $x = 4y - 2$ ....(ii)

LkEkhdj.k (i) 0k (ii) Lk

$$x^2 = x + 2$$

$$x^2 - x - 2 = 0$$

$$\Rightarrow \quad x = \frac{1 \pm \sqrt{1+8}}{2} = \frac{1 \pm 3}{2} = 2, -1$$

LkEkhdj.k (ii) Ek EkkUk j[kUk Ikj

¸kfn $x = 1$ Rkk $y = \frac{1}{4}$

¸kfn $x = 2$ Rkk $y = 1$

fCkn A RkFkk B d fUkn'kkd ØEk'k% A½2] 1½ RkFkk B$\left(-1, \frac{1}{4}\right)$ gkXkA

vHkh"V {kskQYk AOB

¾ $\int_{1}^{2}\left[\left(\frac{x+2}{4}\right)-\left(\frac{x^2}{4}\right)\right]dx$

¾ $\int_{1}^{2}\left[\frac{x}{4}+\frac{1}{2}-\frac{x^2}{4}\right]dx$

¾ $\left[\frac{1}{4}\frac{x^2}{2}+\frac{x}{2}-\frac{x^3}{12}\right]_{-1}^{2}$

¾ $\left(\frac{x^2}{8}+\frac{x}{2}-\frac{x^3}{12}\right)_{-1}^{2}$ ¾ $\left[\left(\frac{4}{8}+\frac{2}{2}-\frac{8}{12}\right)-\left(\frac{1}{8}-\frac{1}{2}+\frac{1}{12}\right)\right]$

¾ $\left[\left(\frac{1}{2}+1-\frac{2}{3}-\frac{1}{8}+\frac{1}{2}-\frac{1}{12}\right)-\left(\frac{1}{8}-\frac{1}{2}-\frac{1}{12}\right)\right]$

¾ $2-\frac{2}{3}-\frac{1}{8}-\frac{1}{12}$ ¾ $\frac{48-16-3-2}{24}$ ¾ $\frac{48-21}{24}$

¾ $\frac{27}{24}$ ¾ $9/8$ bdkb mÙkj

¼vFkOkk½

I = $\int_{0}^{\pi/4}\log(1+\tan x)dx$ ......(i)

= $\int_{0}^{\pi/4}\log\left[1+\tan\left(\frac{\pi}{4}-x\right)\right]dx$

= $\int_{0}^{\pi/4}\log\left[1+\frac{\tan\frac{\pi}{4}-\tan x}{1+\tan\frac{\pi}{4}.\tan x}\right]dx$

= $\int_{0}^{\pi/4}\log\left[1+\frac{1-\tan x}{1+\tan x}\right]dx$

= $\int_{0}^{\pi/4}\log\left[\frac{1+\tan x+1-\tan x}{1+\tan x}\right]dx$

= $\int_{0}^{\pi/4}\log\left[\frac{2}{1+\tan x}\right]dx$

$$= \int_0^{\pi/4} \log 2dx - \int_0^{\pi/4} \log(1+\tan x)dx$$

$$I = \int_0^{\pi/4} \log 2dx - I \qquad \text{by (i)}$$

$$I+I = \int_0^{\pi/4} \log 2dx$$

$$2I = \log 2\int_0^{\pi/4} dx = \log 2(x)_0^{\pi/4} = \log 2\left(\pi/4 - 0\right)$$

$$2I = \pi/4 \log 2$$

$$I = \pi/8 \log 2$$

mRrj 27 fn¸kk g nk j[kkvk d LkEkhdj.k

$$\bar{r} = (i+j) + t(2i - j + k) \qquad \text{............(i)}$$

RkFkk $\bar{r} = (2i + j = k) + s(3i - 5j + 2x)$ ....(ii)

LkEkhdj.k (i) Lk

$$\bar{a}_1 = i + j \qquad \bar{b}_1 = 2i - j + k$$

LkEkhdj.k (ii) Lk

$$\bar{a}_2 = 2i + j - k \qquad \bar{b}_2 = 3i - 5j + 2k$$

$$\therefore \quad \bar{b}_1 \times \bar{b}_2 = \begin{vmatrix} i & j & k \\ 2 & -1 & 1 \\ 3 & -5 & 2 \end{vmatrix}$$

$= i(-2 + 5) - j(4 - 3) + k(-10 + 3)$

$= 3i - j - 7k$

$$\left|\bar{b}_1 \times \bar{b}_2\right| = \sqrt{9+1+49} = \sqrt{59}$$

$$\bar{a}_2 - \bar{a}_1 = (i + j - k) - (i + j)$$

$= i - k$

U¸kUkRkEk njh ¾ $\dfrac{\left[\bar{a}_2 - \bar{a}_1, \bar{b}_1 \times \bar{b}_2\right]}{\left|\bar{b}_1 \times \bar{b}_2\right|}$

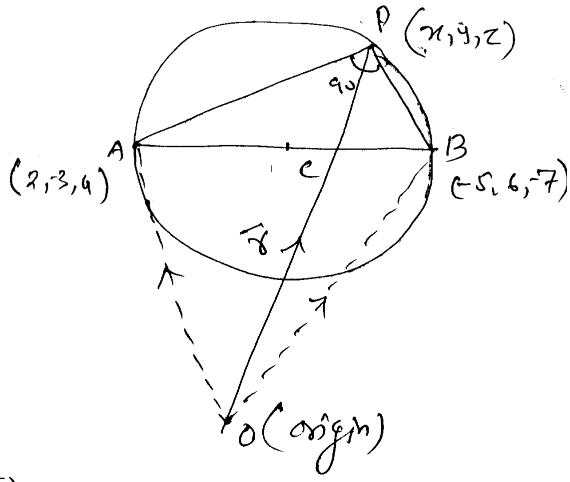
¾ $\dfrac{(\bar{a}_2 - \bar{a})_1, (\bar{b}_1 \times \bar{b}_2)}{\left|\bar{b}_1 \times \bar{b}_2\right|}$

¾ $\frac{(i-k)_1,(3i-j-7k)}{\sqrt{59}} = \frac{3+0+7}{\sqrt{59}}$

¾ $\frac{10}{\sqrt{59}}$ mÙkj A

¼vFkOkk½

fn¸kk g AB XkkYk dk O¸kkLk g fTkLkd fUkn'kkd ØEk'k% ¼2]&3]4½ RkFkk &5]6]7½ g



EkkUkk O EkYk fCkn gA O dk LkkIk{k A RkFkk B d fLFkfRk Lkfn'k ØEk'k%

$\bar{a} = 2i - 3j + 4k$

$\bar{b} = -5i + 6j - 7k$] $\overline{OP} = \bar{r}$

XkkYk dk LkEkhdj.k $(\bar{r} - \bar{a}).(\bar{r} - \bar{b}) = 0$

$$\Rightarrow \quad \left[\bar{r} - (2i - 3j + 4k)\right].\left[\bar{r} - (-5i + 6j - 7k)\right] = 0$$

$$\Rightarrow \quad \left[(\bar{r} - 2i + 3j - 4k)\right].\left[(\bar{r} + 5i - 6j + 7k)\right] = 0 \qquad ....(i)$$

;g vHkh"V lehdj.k gA

XkkYk dk dkfRkdh¸k LkEkhdj.k]

$$(x - x_1)(x - x_2) + (y - y_1)(y - y_2) + (z - z_1)(z - z_2) = 0$$

$$\Rightarrow \quad (x-2)(x+5) + (y+3_1)(y-6) + (z-4)(z+-7) = 0$$

$$\Rightarrow \quad x^2 + y^2 + z^2 + 3x - 3y + 3z - 56 = 0$$

LIk"VRk% bLk XkkYk dk dn $\left(-3/2, 3/2, -3/2\right)$ gA

RkFkk f«kT¸kk $\sqrt{9/4 + 9/4 + 9/4 + 56} = \sqrt{\frac{251}{2}}$

Set - C

gkbZ Ldwy lfVZfQdsV ijh{kk

High School Certificate Examination

lEiy&iz'u i=

SAMPLE PAPER

fo"k; ¼& **(Subject)** - xf.kr | le; 3 ?k.Vk **(Time- 3 Hrs)**

d{kk ¼& **(Class)** - ckjgoha | i.kkZad 100 **(M.M.)**

(Instruction) & ¼funZs'k½

1- lHkh iz'u gy djuk vfuok;Z gSA

Attempt all the Question

2- iz'u Øekad 01 esa 10 vad fu/kkZfjr gSA nks dkWye [k.M gSA [k.M ^^v** esa 05 cgqfodYih; iz'u rFkk [k.M ^^c** esa 05 fjDr LFkkuksa dh iwfrZ vFkok mfpr lEc/k tksfM+,A izR;sd iz'u ds fy, 1 vad vkcafVr gSA

Q. No. 01 Carries 10 Marks. There are two sub-section, Section A is Multiple choice carries 05 marks and section B is fill in the blanks or match the column carries 05 marks.

3- iz'u Øekad 02 ls iz'u Øekad 09 rd vfr y?kqmRrjh; iz'u gSA izR;sd iz'u ij 02 vad vkcafVr gSA mRrj dh vf/kdre 'kCn lhek 30 'kCn A

Q. No. 2 to 09 are very short answer type question & it carries 02 marks each. Word limit is maximum 30.

4- iz'u Øekad 10 ls iz'u Øekad 15 rd y?kqmRrjh; iz'u gSA izR;sd iz'u ij 03 vad vkcafVr gSA mRrj dh vf/kdre 'kCn lhek 50 'kCn A

Q. No. 10 to 15 are short answer type question & it carries 03 marks each. Word limit is maximum 50.

5- iz'u Øekad 16 ls iz'u Øekad 21 rd y?kqmRrjh; iz'u gSA izR;sd iz'u esa vkrafjd fodYi gS vkSj izR;sd iz'u ij 04 vad vkcafVr gSA mRrj dh vf/kdre 'kCn lhek 75 'kCn A

Q. No. 16 to 21 are short answer type question & it carries 04 marks each. Each question has internal choice. Word limit is maximum 75.

6- i'u Øekd 22 l i'u Øekd 25 rd nh?kmRrjh; i'u g A iR;d i'u e vkrfjd fodYi g vkj iR;d i'u ij 05 vd vkcfVr g A mRrj dh vf/kdre 'kCn lhek 100 'kCn A

Q. No. 22 to 25 are long answer type question & it carries 05 marks each. Each question has internal choice. Word limit is maximum 100.

7- i'u Øekd 26 l i'u Øekd 27 rd nh?kmRrjh; i'u g A iR;d i'u e vkrfjd fodYi g vkj iR;d i'u ij 06 vd vkcfVr g A mRrj dh vf/kdre 'kCn lhek 150 'kCn A

Q. No. 26 to 27 are long answer type question & it carries 06 marks each. Each question has internal choice. Word limit is maximum 150.

Ik'Uk 1¼v½ Lkgh f0kdYIk dk Pk¸kUk dhfTk, &

1- $\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix}$ dk EkkUk D¸kk gkXkk&

(a) 0 (b) 15

(c) 19 (d) 27

2- vk0¸kg $A = \begin{bmatrix} 0 & h & g \\ -h & 0 & f \\ -g & -f & 0 \end{bmatrix}$ dkUk Lkk vk0¸kg gA

(a) f0kd.k vk0¸kg (b) LkEkfEkRk vk0¸kg

(c) fo"ke LkEkfEkRk vk0¸kg (d) RkRLkEkd vk0¸kg

3- $\int 1dx$ dk EkkUk gkXkk&

(a) 1 (b) 0

(c) x (d) –1

4- nk LkEkRkYkk $a_1x + b_1y + c_1z + d_1 = 0$ RkFkk $a_2x + b_2y + c_2z + d_2 = 0$ d LkEkkUkkRkj gkUk dk ifrc/k D;k gkXkk &

(a) $a_1a_1 = b_1b_1 = c_1c_1$ (b) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

(c) $a_1a_1 + b_1b_1 + c_1c_1 = 0$ (d) bue l dkb ugh

5- LkgLkCk/k Xk.kkd] nk lekJ;.k x.kkdk dk D;k gkxk\

(a) LkekUrj ek/; (b) x.kkRrj ek/;

(c) gjkRed ek/; (d) bue l dkb ugh

Que 1 (A) Choose the correct answer-

1. The value of $\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix}$ is -

(a) 0 (b) 15

(c) 19 (d) 27

2. Matrix A = $\begin{bmatrix} 0 & h & g \\ -h & 0 & f \\ -g & -f & 0 \end{bmatrix}$ in which type of matrix -

(a) Diagonal matrix (b) Scalar matrix

(c) Odd scalar matrix (d) square matrix.

3. The value of $\int 1dx$ is -

(a) 1 (b) 0

(c) x (d) –1

4. The condition that the place $a_1x + b_1y + c_1z + d_1 = 0$ and $a_2x + b_2y + c_2z + d_2 = 0$ are mutually perpendicular is -

(a) $a_1a_2 = b_1b_2 = c_1c_2$ (b) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

(c) $a_1a_2 + b_1b_2 + c_1c_2 = 0$ (d) none of the above

5. The coefficient of correlation is the .... of coefficient of regression.

(a) Arithmetic mean (b) Geometric mean

(c) Hormonic mean (d) None of the above.

¼c½ fjDRk LFkkUkk dh IkfRk djk&

1- fCknvk ¼3] 1] &2½ vkj ¼&2] 1] 3½ Lk TkkUk 0kkYkh j[kk d fnd dkT;k; &&&& gkXkA

2- $D^n a^x$ dk EkkUk &&& gkXkk A

3- $\frac{d}{dx}\log\sec x$ dk EkkUk&&&&&&& gkRkk gA

4- nk ?kukdkj iklk dk ,d lkFk Qdu ij ifrn'k lef"V e dy vo;ok dh l[;k &&&&&& gkxhA

5- fdlh oLr dk {kfRkTk Lk α dk.k ikjfHkd ox u Lk Ik{kfIkRk fd¸kk Tkk, Rkk oLr dh egRre Åpkb &&&&& gkXkh A

(B) Fill in the blanks -

1. The direction cosines of the line passing through the points (3, 1, –2) and (–2, 1, 3) is ....

2. The value of $D^n a^x$ is ....

3. The value of $\frac{d}{dx}\log\sec x$ is ....

4. Total number of ways in which two dice may be thrown is ....

5. A particle is projected with a velocity u at an angle of α. The greatest height is ....

Ik'Uk 2- fLk) dhfTk, fd $2\tan^{-1}\left(\frac{1}{3}\right)=\cos^{-1}\frac{4}{5}$.

Prove that $2\tan^{-1}\left(\frac{1}{3}\right)=\cos^{-1}\frac{4}{5}$.

Ik'Uk 3- ;fn $\bar{a}=i+3j-2k$ rFkk $\bar{b}=i+3k$ rk $|\bar{a}\times\bar{b}|$ dk eku Kkr djk A

If $\bar{a}=i+3j-2k$ and $\bar{b}=i+3k$, then find the value of $|\bar{a}\times\bar{b}|$.

Ik'Uk 4- fcUn (7, 14, 5) l lery $2x+4y-z=0$ ij Mky x; yc dh yckb Kkr dhft ,A

Find the length of the perpendicualr from the point (7, 14, 5) to the plane $2x+4y-z=0$.

Ik'Uk 5- $\int_{-\pi/2}^{\pi/2}\cos x\,dx$ dk EkkUk KkRk dhfTk,A

Evaluate $\int_{-\pi/2}^{\pi/2}\cos x\,dx$.

Ik'Uk 6- vOkdYk LkEkhdj.k $\frac{dy}{dx}=x\sin x$ dk eku Kkr dhfTk, A

Solve the differential equation $\frac{dy}{dx}=x\sin x$.

Ik'Uk 7- CkfYk¸kUk CkhTkXkf.kRk $[B,+,']$ d fdLkh vOk¸kOk x d fYk, fLk) dhfTk, fd $x+x=x$.

If $[B,+,']$ is Boolean Algebra and $x \in B$ then prove that $x+x = x$.

Ik'Uk 8- dEI;Vj dh fo'k"krk, fyf[k;A

Write the uses of computer.

Ik'Uk 9- ¸kfn $\dfrac{x+1}{(x+2)(x+3)} = \dfrac{A}{x+2} + \dfrac{B}{x+3}$ gks rks $A \,.\, B$ dk eku Kkr dhft, A

If $\dfrac{x+1}{(x+2)(x+3)} = \dfrac{A}{x+2} + \dfrac{B}{x+3}$, then find the value of $A \,.\, B$.

Ik'Uk 10- LkjYkRkEk :Ik Ek 0¸kDRk dhfTk, $\tan^{-1}\left(\dfrac{\sqrt{1+x^2}-1}{x}\right)$.

Write $\tan^{-1}\left(\dfrac{\sqrt{1+x^2}-1}{x}\right)$ in simplest form.

Ik'Uk 11- ;fn $\overline{a} = 2i - 2j + 2k,\ \overline{b} = 2i + j - k$ rFkk $\overline{c} = j + k$ gk rk $[\overline{a}, \overline{b}, \overline{c}]$ dk eku Kkr dhft , A

If $\overline{a} = 2i - 2j + 2k,\ \overline{b} = 2i + j - k$ and $\overline{c} = j + k$ then find the value of $[\overline{a}, \overline{b}, \overline{c}]$.

Ik'Uk 12- fuEu v0kdYk LkEkhdj.k $(1+x^2)\dfrac{dy}{dx} + 2xy = 4x^2$ dk lekdyu x.kkd Kkr dhft ,A

Find the integrating factor of differential equation $(1+x^2)\dfrac{dy}{dx} + 2xy = 4x^2$.

Ik'Uk 13- rk'k d iRrk dh xMMh l ;knPN;k fudky tku ij mld gde dk iRrk ;k bDdk vku dh ikf;drk Kkr dhft ,A

A card is drawn from an ordinary pack of cards find the probability of getting ace or a spade.

Ik'Uk 14- CkfYk¸kUk QYkUk $f(x,y,z) = x.y + z.(x' + y')$ dk fLOkfPkXk IkfjIkFk [khfPk, A

Draw switching circuit for the Boolean function

$$f(x,y,z) = x.y + z.(x' + y')$$

Ik'Uk 15- lpuk ik|kfxdh e eYVhehfM;k d mi;kx gr D;k&D;k vko'd midj.k g\

What is multimedia? Write the required configuration to install it?

Ik'Uk 16- ¸kfn $y = \tan^{-1}\sqrt{\frac{1+x}{1-x}}$ gk Rkk $\frac{dy}{dx}$ dk EkkUk KkRk dhfTk,

If $y = \tan^{-1}\sqrt{\frac{1+x}{1-x}}$, then find the value of $\frac{dy}{dx}$.

¼vFkOkk½

$\frac{\log x}{x}$ dk mfPPk"B EkkUk KkRk dhfTk, A

Find the maximum value of $\frac{\log x}{x}$.

Ik'Uk 17- ,d d.k 30 fEkUkV Lkd.M d OkXk Lk Åij Ik{kfIkRk fd¸kk Xk¸kk RkFkk mLkh LkEk¸k ,d nLkjk d.k mLkh m/Okk?kj j[kk Ikj 90 EkhVj dh ÅPkkb Lk UkhPk fXkjk¸kk Xk¸kk KkRk dhfTk, fd Ok dCk vkj dgk fEkYkXk A

A particle is projected upwards with a velocity of 30 m/sec. and at the same time another particle is left fall from a height of 90 m in the same vertical line. Find when and where they will meet?

¼vFkOkk½

,d d.k fTkLk Ik{kIk fCknXkRk {kfRkTk LkEkRkYk Ikj CkUk ,d Yk{¸k Ikj Ikf{kRk dj Ikf{kIRk fd¸kk TkkRkk gA Yk{¸k Lk a Ekh- bLk vkj fXkjRkk ¼nj½ fXkjRkk g TkCkfd Ik{kIk dk.k α g RkFkk Yk{¸k b ehVj bl vkj ¼nj½ fxjrk g tcfd i{ki dk.k β gA ;fn nkUkk fLFkfRk¸kk Ek Ik{kIk OkXk ,d LkEkkUk gk Rkk fLk) dhfTk, fd mIk¸kDRk mRFkkUk (Elevation)– $\frac{1}{2}\sin^{-1}\left[\frac{a\sin 2\beta + b\sin 2\alpha}{a+b}\right]$ gkXkk A

A particle aimed at a mark which is in a horizontal plane through the point of projection, falls a feet short of it when the elevation is α and goes b feet too far when the elevation is β. Show that, if the velocity of projection be the same in all cases, the proper elevation is–

$$\frac{1}{2}\sin^{-1}\left[\frac{a\sin 2\beta + b\sin 2\alpha}{a+b}\right].$$

Ik'Uk 18- EkkUk KkRk dhfTk, &

Find the vlaue of the determinant :

$$\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix}$$

¼vFkOkk½

EkkUk KkRk dhfTk, &

Find the value of the determinant :

$$\begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix}$$

Ik'Uk 19- ¸kfn $f(x) = x^2 - 5x + 7$ Rkk $f(\mathrm{A})$ dk EkkUk KkRk dhfTk,] TkCk $\mathrm{A} = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$

If $\mathrm{A} = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ and $f(x) = x^2 - 5x + 7$, then find he value of $f(\mathrm{A})$

¼vFkOkk½

¸kfn $\mathrm{A} = \begin{bmatrix} 2 & 3 & 1 \\ 3 & 4 & 1 \\ 3 & 7 & 2 \end{bmatrix}$ gk Rkk A^{-1} dk EkkUk KkRk dhfTk,A

If $\mathrm{A} = \begin{bmatrix} 2 & 3 & 1 \\ 3 & 4 & 1 \\ 3 & 7 & 2 \end{bmatrix}$, then find the value of A^{-1}.

Ik'Uk 20- k dk EkkUk KkRk dhfTk, ¸kfn j[kk, $\frac{x-1}{-3} = \frac{y-2}{2k} = \frac{z-3}{2}$ RkFkk $\frac{x-1}{3k} = \frac{y-5}{1} = \frac{z-6}{-5}$ IkjLIkj YkCkOkRk gA

The line $\frac{x-1}{-3}=\frac{y-2}{2k}=\frac{z-3}{2}$ and $\frac{x-1}{3k}=\frac{y-5}{1}=\frac{z-6}{-5}$ are perpendicular to each other, then find the value of k.

¼vFkOkk½

¸kfn XkkYk dk LkEkhdj.k $5(x^2+y^2+z^2) + 10x - 6y + 8z + 5 = 0$ g Rkk bLkdk dæ RkFkk f«kT¸kk KkRk dhfTk, A

Find the radius and centre of the sphere $5(x^2+y^2+z^2) + 10x - 6y + 8z + 5 = 0$.

Ik'Uk 21- ¸kfn $y\sqrt{1-x^2}+x\sqrt{1-y^2}=1$ gk Rkk fLk) dhfTk, fd $\frac{dy}{dx}+\sqrt{\frac{1-y^2}{1-x^2}}=0$

If $y\sqrt{1-x^2}+x\sqrt{1-y^2}=1$, then prove that $\frac{dy}{dx}+\sqrt{\frac{1-y^2}{1-x^2}}=0$.

¼vFkOkk½

¸kfn $x=a(t+\sin t)$ RkFkk $y=a(1-\cos t)$ rk $\frac{dy}{dx}$ dk eku Kkr dhft ,A

If $x=a(t+\sin t)$ and $y=a(1-\cos t)$ then find the value of $\frac{dy}{dx}$.

Ik'Uk 22- fUkEUkfYkf[kRk Lkkj.kh Ek fIkRkk vkj Ik«k dh ÅPkkb n'kk¸kh Xk¸kh g A bLkLk Lkg&LkCk/k Xk.kkd dh Xk.kUkk dhfTk, &

fIkRkk dh ÅPkkb (x)	65	66	66	67	68	69	70
Ik«k dh ÅPkkb (y)	67	68	66	69	72	72	69

In the follwing table height of father and son are shown. Calculate the coefficient of correlation -

Height of father (x)	65	66	66	67	68	69	70
Height of son (y)	67	68	66	69	72	72	69

¼vFkOkk½

¸kfn nk LkEkkJ¸k.k j[kkvk (Regression lines) d CkhPk dk dk.k θ g Rkk fLk) dhfTk, fd $\tan\theta=\left(\frac{1-r^2}{r}\right)\left(\frac{\sigma x.\sigma y}{\sigma^2 x+\sigma^2 y}\right)$

If θ be gthe acute angle between the two regression lines of the variable x and y, then prove that : $\tan\theta = \left(\frac{1-r^2}{r}\right)\left(\frac{\sigma x.\sigma y}{\sigma^2 x+\sigma^2 y}\right)$

Ik'Uk 23- $I = \int \sec^3 xdx$ dk EkkUk KkRk dhfTk, A

Evaluate : $I = \int \sec^3 xdx$

¼vFkOkk½

$I = \int \frac{x\sin^{-1} x}{\sqrt{1-x^2}}dx$ dk EkkUk KkRk dhfTk, A

Evaluate : $I = \int \frac{x\sin^{-1} x}{\sqrt{1-x^2}}dx$

Ik'Uk 24- dk.k θ Ikj fØ¸kk dj jg nk CkYk P vkj Q dk Ikfj.kkEkh CkYk $(2m+1)\sqrt{P^2+Q^2}$ d CkjkCkj g A TkCk CkYk $\left(\frac{\pi}{2}-\alpha\right)$ dk.k Ikj fØ¸kk djRk g Rkk Ikfj.kkEkh CkYk $(2m-1)\sqrt{P^2+Q^2}$ d CkjkCkj gkRkk g Rkk fLk) dhfTk, fd $\tan\alpha = \frac{(m-1)}{(m+1)}$

Two forces acting at angle θ are P and Q and has $(2m+1)\sqrt{P^2+Q^2}$ as resultant when they act at angle $\left(\frac{\pi}{2}-\alpha\right)$, then resultant force becomes $\left(\frac{\pi}{2}-\alpha\right)$, then prove that $\tan\alpha = \frac{(m-1)}{(m+1)}$

¼vFkOkk½

,d d.k Ikj Pkkj CkYk P, $2P$, $3\sqrt{3}P$ vkj $4P$ YkXk gA IkgYk RkFkk nIj] nIj rFkk RkhLkj] RkhLkj RkFkk PkkFk CkYkk d CkhPk d dk.k ØEk'k% 60°, 90°, 150° gk rk Ikfj.kkEkh CkYk dk IkfjEkk.k vkj fn'kk KkRk dhfTk, A

If four forces P, $2P$, $3\sqrt{3}P$ and $4P$ act on a point such that angle between first and second is 60°, second and third is 90°, third and fourth is 150°. Then find their resultant and direction.

Ik'Uk 25- ,d oØ fUkEUkfYkf[kRk fCknvk Lk gkdj TkkRkk g&

x	1	1-5	2	2-5	3	3-5	4
y	2	2-4	2-7	2-8	3	2-6	2-1

bLkLk LkEkYkECk PkRkHkTkh¸k fUk¸kEk Lk oØ x–v{k RkFkk j[kkvk $x = 1, x = 4$ Lk f?kj g, {k«k dk {k«kQYk KkRk dhfTk, A

A curve passes through the following points :

x	1	1.5	2	2.5	3	3.5	4
y	2	2.4	2.7	2.8	3	2.6	2.1

using trapezoidal rule find the area bounded by the curve x-axis and the line $x = 1, x = 4$.

¼vFkOkk½

fn¸kk Xk¸kk g fd $e^o = 1, e^1 = 2.72, e^2 = 7.39, e^3 = 20.09, e^4 = 54.60$ LkEkkdYk $\int_0^4 e^x dx$ dk EkkUk fLkEIkLkUk fUk¸kEk Lk KkRk dhfTk, A

Given that $e^o = 1, e^1 = 2.72, e^2 = 7.39, e^3 = 20.09, e^4 = 54.60$. Find the value of $\int_0^4 e^x dx$ by simpson's rule.

Ik'Uk 26- oØ $x^2 = 4y$ vkj j[kk $x = 4y - 2$ d CkhPk dk {k«kQYk KkRk dhfTk, A

Find the area enclosed between the curve $x^2 = 4y$ and $x = 4y - 2$.

¼vFkOkk½

EkkUk KkRk dhfTk, &

Evaluate :

$$\int_0^{\pi/4} \log(1 + \tan x) dx$$

Ik'Uk 27- mLk XkkYk dk Lkfn'k LkEkhdj.k KkRk dhfTk, fTkLkdk O¸kkLk AB g Tkgk A vkj B d fUkn'kkd A¼2] &3] 4½ RkFkk B¼&5] 4] &7½ fn, gA XkkYk d LkEkhdj.k dk dkRkh¸k :Ik dh KkRk dhfTk, A bLkdh f«kT¸kk vkj dæ Hkh KkRk dhfTk, A

Find the vector equation of the sphere whose diameter is AB and the co-ordinate of ends A and B are (2, –3, 4) and (–5, 6, –7) respectively. Also find its equation in carterian form and find radius and centre of the sphere.

¼vFkok½

nk j[kkvk d CkhPk dh U¸kUkRkEk njh KkRk dhfTk, fTkUkd Lkfn'k LkEkhdj.k]
$\overline{r} = (i + j) + t(2i - j + k)$ RkFkk $\overline{r} = (2i + j - k) + s(3i - 5j + 2k)$ gA

Find the shortest distance between the lines $\overline{r} = (i + j) + t(2i - j + k)$ and $\overline{r} = (2i + j - k) + s(3i - 5j + 2k)$.

LkEIkYk lkIkj dk vkn'k lV&C

mÙkj 1- ¼v½ Lkgh fOkdYIk dk Pk¸kUk dhfTk,

1- (a) 0

2- (c) fo"ke lefer LkEkg

3- (c) x

4- (b) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

5- (b) x.kkRrj ek/;

¼c½ fjDr LFkku dk Hkjk&

1- $-\frac{1}{\sqrt{2}}, 0, \frac{1}{\sqrt{2}}$

2- $a^x(\log a)^n$

3- $\tan x$

4- 36

5- $T = \frac{u^2 \sin\alpha}{2g}$

mÙkj 2- $2\tan^{-1}\left(\frac{1}{3}\right) = \cos^{-1}\frac{4}{5}$

l= $2\tan^{-1}x = \cos^{-1}\frac{1-x^2}{1+x^2}$ l tgk $x = \frac{1}{3}$

L.H.S. $= \cos^{-1}\left(\frac{1-\left(\frac{1}{3}\right)^2}{1+\left(\frac{1}{3}\right)^2}\right)$

$= \cos^{-1}\left(\frac{1-\frac{1}{9}}{1+\frac{1}{9}}\right) = \cos^{-1}\left(\frac{\frac{8}{9}}{\frac{10}{9}}\right)$

$= \cos^{-1}\left(\frac{8}{9}\times\frac{9}{10}\right) = \cos^{-1}\left(\frac{4}{5}\right)$

mÙkj 3- fn¸kk g $\bar{a} = i + 3j - 2k$

$\bar{b} = i + 3k$

$$\bar{a} \times \bar{b} = \begin{vmatrix} i & j & k \\ 1 & 3 & -2 \\ 1 & 0 & 3 \end{vmatrix}$$

$= i[3 \times 3 - 0(-2)] - j[1 \times 3 - 1(-2)] + k[1 \times 0 - 1 \times 3]$

$= i[9 - 0] - j[3 + 2)] + k[0 - 3]$

$= 9i - 5j - 3k$

$|\bar{a} \times \bar{b}| = \sqrt{9^2 + (-5)^2 + (-3)^2}$

$= \sqrt{81 + 25 + 9} = \sqrt{115}$

mÙkj 4 fn¸kk g & LkEkRkYk dk LkEkhdj.k

$2x + 4y - z = 2$

$2x + 4y - z - 2 = 0$ ....(i)

l= fcUn (x_1, y_1, z_1) l lery $ax + by + cz + d = 0$ ij Mky x; yc dh

yckb $= \dfrac{2.7 - 4.14 - 1.5 - 2}{\sqrt{2^2 + 4^2 + (-1)^2}}$

$= \dfrac{14 + 56 - 5 - 5}{\sqrt{4 + 16 + 1}} = \dfrac{63}{\sqrt{21}} = \dfrac{3 \times 21}{\sqrt{21}} = 3\sqrt{21}$

mRRkj 5 $I = \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \cos x dx$

$= [\sin x]_{-\pi/2}^{\pi/2}$

$= \left[\sin \pi/2 - \sin\left(-\pi/2\right)\right] = \sin \pi/2 + \sin \pi/2$ ($\because$ $\sin(-x) = -\sin x$)

$= 1 + 1 = 2$

mÙkj 6 vOkdYk LkEkhdj.k

$$\frac{dy}{dx} = x \sin x$$

$\Rightarrow$ $dy = x \sin x \, dx$

integrating b.s.

$$\int dy = \int x \sin x dx + c$$

$$y = x\int \sin x dx - \int \frac{d}{dx} x . \int \sin x dx + c$$

$$y = x(-\cos x) - \int 1.(-\cos x) dx + c$$

$$y = -x\cos x - \int \cos x dx + c$$

$$y = -x\cos x + \sin x + c$$ mRrj

mÙkj 7 CkfYk¸kUk CkhTkXkf.kRk $[B,+,']$ d fdLkh vOk¸kOk x d fYk,

⇒ ck;k i{k = x + x

= (x + x) . 1 [1] x.ku rRled gA]

= (x+x) (x+x') [ijd fu;e l x+x' = 1]

= x + (x+x') [forj.k fu;e l x+x' = 1]
x + (x.x') = (x+x).(x+x')

= x + 0 [ijd fu;e l x.x' = 0]

= 0 [0 ;kT; rRled g]

vr% x + x = x

mÙkj 8 dEI;Vj dh fo'k"krk, fuEufyf[kr gA

1- lxg.k {kerk

2- 'k) rk

3- l{kerk

4- cf) yfC/k

mÙkj 9- $$\frac{x+1}{(x+2)(x+3)} = \frac{A}{x+2} + \frac{B}{x+3}$$ ....(i)

⇒ $x + 1 = A(x+3) + B(x+2)$ ....(ii)

;fn $x = -3$

x dk eku leh- (ii) e j[ku ij

$-3+1 = A.0 + B(-3+2)$

$-2 = -B$ ⇒ $B = 2$

;fn $x = -2$

x dk eku leh- (ii) e j[ku ij

$-2+1 = 0 + A(-2+3) + B.0$

$-1 = A \quad \Rightarrow \quad A = -1$

leh- (ii) vkj (iii) l

$\therefore \quad A . B = (-1) . 2 = -2$

mÙkj 10- eku yk $x = \tan\theta$ vr% $\theta = \tan^{-1} x$

$$\therefore \tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$$

$$= \tan^{-1}\left(\frac{\sqrt{1+\tan^2\theta}-1}{\tan\theta}\right)$$

$$= \tan^{-1}\left(\frac{\sec\theta-1}{\tan\theta}\right)$$

$$= \tan^{-1}\left(\frac{\frac{1}{\cos\theta}-1}{\frac{\sin\theta}{\cos\theta}}\right) = \tan^{-1}\left(\frac{\frac{1-\cos\theta}{\cos\theta}}{\frac{\sin\theta}{\cos\theta}}\right)$$

$$= \tan^{-1}\left(\frac{\frac{1-\cos\theta}{\cos\theta}}{\frac{\sin\theta}{\cos\theta}}\right) = \tan^{-1}\left(\frac{1-\cos\theta}{\sin\theta}\right)$$

$$= \tan^{-1}\left(\frac{2\sin^2 \theta/2}{2\sin\theta/2 . \cos\theta/2}\right)$$ l= $\because \cos\theta = 1 - 2\sin^2 \theta/2$

$\because \sin\theta = 2\sin\theta/2 . \cos\theta/2$

$$= \tan^{-1}\left(\frac{\sin\theta/2}{\cos\theta/2}\right)$$

$$= \tan^{-1}\left(\tan \theta/2\right)$$

$$= \theta/2$$

$$= \frac{1}{2}\tan^{-1}x$$

vr% $$\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right) = \frac{1}{2}\tan^{-1}x$$

mÙkj 11 fn;k g $\bar{a} = 2i - 2j + 2k$

$\bar{b} = 2i + j - k$

$\bar{c} = j + k$ gk rk

l = $\left[\bar{a},\bar{b},\bar{c}\right] = \bar{a}.\left(\bar{b}\times\bar{c}\right)$

$\left(\bar{b}\times\bar{c}\right) = (2i + j - k)\times(j + k)$

$$= \begin{vmatrix} i & j & k \\ 2 & 1 & -1 \\ 0 & 1 & 1 \end{vmatrix}$$

$= i[1.1 - 1(-1)] - j[2.1 - 0(-1)] + k[2.1 - 1.0]$

$= i[1 + 1] - j[2 - 0)] + k[2 - 0]$

$= 2i - 2j + 2k$

$\therefore \left[\bar{a},\bar{b},\bar{c}\right] = \bar{a}.\left(\bar{b}\times\bar{c}\right)$

vr% foLFkkiu $= (2i - 2j - 3k)\times(2i - 2j - 2k)$

$= 2.2 + (-2)(-2) + 3.2$

$= 4 + 4 + 6$

$= 14$

=

mÙkj 12 vOkdYk LkEkhdj.k

$$(1+x^2)\frac{dy}{dx} + 2xy = 4x^2 \qquad ....(i)$$

$$\Rightarrow \frac{dy}{dx} + \frac{2xy}{1+x^2} = \frac{4x^2}{1+x^2} \qquad ....(ii)$$

leh- (ii) dh ryuk $\frac{dy}{dx}+Py=Q$ l dju ij

$$P=\frac{2xy}{1+x^2}, Q=\frac{4x^2}{1+x^2}$$

$\therefore$ I.F. $= e^{\int p.dx}$

$= e^{\int \frac{2xy}{1+x^2}.dx}$

vc ekuk fd $1+x^2=t$

$\Rightarrow \quad 2xdx = dt$

$\therefore$ I.F. $= e^{\int \frac{1}{t}dt}$

$= e^{\log t}$

$= t = 1+x^2$

vr% lekdyu x.kkd ¾ $1+x^2$

mÙkj 13- **iFke fof/k%&**

rk'k dh xMMh e iRrk dh l[;k ¾ 52

52 iRrk e l ,d iRrk fudkyu d rjhd ¾ $^{52}C_1 = 52$

n(S) = 52

13 gde d iRrk e l 1 iRrk fudkyu d rjhd ¾ $^{13}C_1 = 13$

$\because$ gde d iRrk e l ,d iRrk bDdk 'kkfey g b lfy, 'k"k cp bDd dh l[;k ¾ 3

3 bDd e l 1 iRrk fudkyu d rjhd ¾ $^{3}C_1 = 3$

1 gde dk iRrk ;k 1 bDdk gku d dy rjhd ¾ 13 + 3 = 16

n(E) = 16

$\therefore$ lkkf¸kdRkk ¾ $\frac{n(E)}{n(S)}=\frac{16}{52}=\frac{4}{13}$

f}rh; fof/k%&

ekuk fd bDdk fudkyu dh ?kVuk A rFkk gde dk iRrk fudkyu dh ?kVuk B gA rk i'ukulkj %&

n(S) = 52, n(A) = 4, n(B) = 13, n(A$\cap$B) = 1

¼D;kfd rk'k dh xMMh e pkj bDdk rFkk 13 gde d iRr gkr g rFkk ,d gde dk bDde gkrk gA½

$$\therefore \qquad P(A) = \frac{n(A)}{n(S)} = \frac{4}{52}$$

$$P(B) = \frac{n(B)}{n(S)} = \frac{13}{52}$$

$$P(A \cap B) = \frac{n(A \cap B)}{n(S)} = \frac{1}{52}$$

$$\because \qquad \text{l=}\ P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$P(A \cup B) = \frac{4}{52} + \frac{13}{52} - \frac{1}{52} = \frac{4+13-1}{52} = \frac{16}{52} = \frac{4}{13}$$

mRRkj 14 fn¸kk g QYkUk

$$f = x.y + y.z$$

mÙkj 15 lpuk ik|kfxdh e eYVhehfM;k d mi;kx gr vko';d midj.k fuEukulkj g&

1- de l de ifUV;e ;k 600 exk gVt l vf/kd lyjku iklljA
2- 128 ,e-ch- je ;k vf/kd
3- foUMkt vkijfVx flLVe dk rktk lLdj.k
4- lhMh jke Mkbo ¼32 ,Dl l vf/kd½
5- lkmM dkM
6- LihdjA

mÙkj 16- fn¸kk g

$$y = \tan^{-1}\sqrt{\frac{1+x}{1-x}} \qquad \text{........(i)}$$

EkkUkk $x = \cos\theta$ lehdj.k (i) l

$$y = \tan^{-1}\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = an^{-1}\sqrt{\frac{2\cos^2\theta/2}{2\sin^2\theta/2}} = \tan^{-1}\sqrt{2\cot^2\theta/2}$$

$$y = \tan^{-1}\left(2\cot\theta/2\right) = \tan^{-1}\left[\tan\left(\pi/2 - \theta/2\right)\right]$$

$$y = \left(\pi/2 - \theta/2\right) = \pi/2 - 1/2\cos^{-1}x$$

Diff. w.r. to x

$$\frac{dy}{dx} = \frac{d}{dx}\left[\pi/2 - 1/2\cos^{-1}x\right]$$

$$= 0 - 1/2\left(-\frac{1}{\sqrt{1-x^2}}\right) = \frac{1}{2\sqrt{1-x^2}}$$

¼vFkok½

EkkUkk $y = \dfrac{\log x}{x}$

Diff. w.r. to x

$$\frac{dy}{dx} = \frac{x.\frac{1}{x} - \log x.1}{x^2} = \frac{1-\log x}{x^2} \quad \text{........(ii)}$$

Again Diff. w.r. to x

$$\frac{d^2y}{dx^2} = \frac{x^2\left(0-\frac{1}{x}\right) - (1-\log x)2x}{\left(x^2\right)^2} = \frac{-x-2x(1-\log x)}{x^4}$$

$$= \frac{-x-2x-2x\log x}{x^4} = \frac{x(-3+2\log x)}{x^4}$$

$$= \frac{-3+2\log x}{x^3} \quad \text{........(iii)}$$

Condition for Max^m or Min^m is

$$\left[\frac{dy}{dx} = 0\right] \text{ puting (ii)}$$

$\therefore\ 0 = \dfrac{1-\log x}{x^2}$

$\Rightarrow\ 1 - \log x = 0 \Rightarrow \log x = 1 \Rightarrow \log x = \log_e x$

$\Rightarrow\ x = e$

$$\therefore \frac{d^3y}{dx^3} at\ \ x = e = \frac{3 + 2\log_e e}{e^3}$$

$$= \frac{-3+2}{e^3} = \frac{-1}{e^3} = -\text{ve}$$

$\therefore$ The given function is Max^m at $x = e$.

$\therefore$ Max^m value at $x = e = y = \dfrac{\log_e e}{e} = e$.

mÙkj 17- fn¸kk g u ¾ 30 Ekh-@Lkd.M

ekkUkk vHkh"V LkkEk¸k t RkFkk vHkh"V ÅPkkbZ Ik{kIk fCkn Lk h g RkFkk XkR0kh¸k g gA

IkFkEk fLFkfRk $h = ut - ½gt^2$

$h = 30t - ½gt^2$ ....(i)

f}Rkh¸k fLFkfRk Ek u ¾ 0] $h = 90 - h$

$\therefore$ $90 - h$ ¾ $0 - ½gt^2$

$90 - h$ ¾ $½gt^2$ ....(ii)

Adding (i) and (ii)

$90 = 30\,t$

$t = \dfrac{90}{30} =$ sec.

Putting the value of $t = 3$ in eqn. (i)

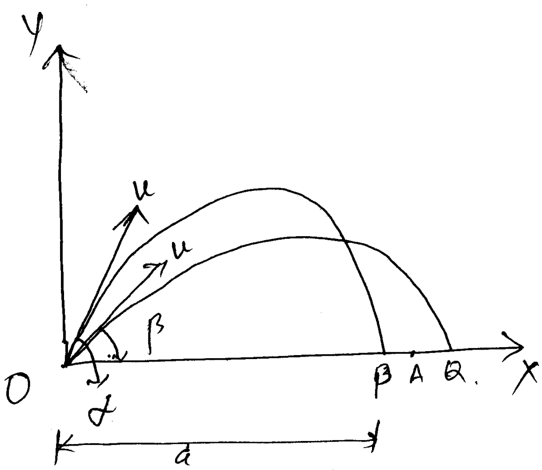
$h = 30.3 - ½g(3)^2$

$h = 90 - ½×9.8×9$

$h = 90 - 4.9×9$

$h = 90 - 44.1 = 45.9$ ehVj

¼vFkok½



$OP = a,\ OQ = b$

EkkUk fYk¸kk fd nkUkk fLFkfRk¸kk Ek O Lk Ik{kIk 0kXk u g RkFkk A Yk{¸k g A EkkUk fYk¸kk fd $OA=R$ RkFkk O Lk TkkUk 0kkYk {kfRkTk RkYk dk Ik{kI¸k P RkFkk Q Ikj vk?kkRk djRkk g TkCkfd Ik{kIk dk.k ØEk'k% α RkFkk β g RkCk nkUkk fLFkfRk¸kk Ek {kfRkTk IkjkLk ØEk'k% $R - a$ RkFkk $R + b$ gkXkk vRk%

$$R - a = \frac{u^2}{g}\sin 2\alpha \qquad ....(i)$$

$$R + b = \frac{u^2}{g}\sin 2\beta \qquad ....(ii)$$

LkEkhdj.k (i) dk b Lk RkFkk (ii) dk a Lk Xk.kk dj TkkMUk Ikj

$$R(b - a) = \frac{u^2}{g}\left(b\sin 2\alpha + a\sin 2\beta\right)$$

$$R = \frac{u^2}{g}\left(\frac{b\sin 2\alpha + a\sin 2\beta}{a+b}\right) \qquad ....(iii)$$

EkkUkk fd Yk{¸k A Ikj vk?kkRk djUk d fYk, mIk¸kDRk mRFkkUk θ g RkCk

$$R = \frac{u^2}{g}\sin 2\theta \qquad ....(iv)$$

LkEkhdj.k (iii) vkj (iv) dh RkYkUkk djUk Ikj

$$\frac{u^2}{g}\sin 2\theta = \frac{u^2}{g}\left(\frac{b\sin 2\alpha + a\sin 2\beta}{a+b}\right)$$

$$\sin 2\theta = \frac{a\sin 2\beta + b\sin 2\alpha}{a+b}$$

$$\theta = \sin^{-1}\left(\frac{a\sin 2\beta + b\sin 2\alpha}{a+b}\right)$$

mÙkj 18

$$\Delta = \begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix}$$

$C_1 - C_2$, $C_2 - C_3$

$$= \begin{vmatrix} a & 0 & 1 \\ -b & b & 1 \\ 0 & -c & 1+c \end{vmatrix}$$

$R_2 - R_1$

$$= \begin{vmatrix} a & 0 & 1 \\ -b-a & b & 0 \\ 0 & -c & 1+c \end{vmatrix}$$

$$= a\{b(1+c)+0\} - 0 + 1\{-c(-b-a) - a\}$$

$$= ab(1+c) + c(a+b)$$

$$= ab + abc + ac + bc = abc + bc + ca + ab$$

$$= abc\left(1 + \frac{1}{a} + \frac{1}{b} + \frac{1}{c}\right)$$

¼vFkok½

$$\Delta = \begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix}$$

$C_1 + (C_2 + C_3)$

$$= \begin{vmatrix} 2a+2b+2c & a & b \\ 2a+2b+2c & b+c+2a & b \\ 2a+2b+2c & a & c+a+2b \end{vmatrix}$$

C_1 Ek Lk ¼2a + 2b + 2c½ dk common fUkdkYkk

$$= 2¼a + b + c½ \begin{vmatrix} 1 & a & b \\ 1 & b+c+2a & b \\ 1 & a & c+a+2b \end{vmatrix}$$

$R_1 - R_2$ and $R_2 - R_3$

$$= 2¼a + b + c½ \begin{vmatrix} 0 & -(a+b+c) & b \\ 0 & a+b+c & -(a+b+c) \\ 1 & a & c+a+2b \end{vmatrix}$$

$$= 2¼a + b + c½ \; [0 + ¼a + b + c½\{ 0 + (a + b + c)\} + 0]$$

$$= 2¼a + b + c½^3$$

mÙkj 19 fn;k g $f(x) = x^2 - 5x + 7$

Put $x = A$ in (i)

$f(A) = A^2 - 5A + 7I$

$$A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix} \text{ and } I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$A^2 = A.A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix} = \begin{bmatrix} 9-1 & 3+2 \\ -3-2 & -1+4 \end{bmatrix}$$

$$= \begin{bmatrix} 8 & 5 \\ -5 & 3 \end{bmatrix}$$

LkEkhdj.k (ii) Lk

$f(A) = A^2 - 5A + 7I$

$$= \begin{bmatrix} 8 & 5 \\ -5 & 3 \end{bmatrix} - 5\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix} + 7\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 8 & 5 \\ -5 & 3 \end{bmatrix} - \begin{bmatrix} 15 & 5 \\ -5 & 10 \end{bmatrix} + \begin{bmatrix} 7 & 0 \\ 0 & 7 \end{bmatrix}$$

$$= \begin{bmatrix} 8-15+7 & 5-5+0 \\ -5+5+0 & 3-10+7 \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} = 0$$

¼vFkok½

$$A = \begin{bmatrix} 2 & 3 & 1 \\ 3 & 4 & 1 \\ 3 & 7 & 2 \end{bmatrix} \text{ gk Rkk}$$

$$\therefore \ |A| = \begin{vmatrix} 2 & 3 & 1 \\ 3 & 4 & 1 \\ 3 & 7 & 2 \end{vmatrix}$$

= 2 (8 – 7) – 3 (6 – 3) + 1 (21 – 21)
= 2 – 9 + 9
= 2

$\therefore$ Cofactor of A:- $A_{11} = 1 \quad A_{21} = 1 \quad A_{31} = -1$
$A_{12} = -3 \quad A_{22} = 1 \quad A_{32} = 1$
$A_{13} = 9 \quad A_{23} = -5 \quad A_{33} = -1$

$$\therefore \text{ Adj } A\text{:-} \begin{bmatrix} A_{11} & A_{21} & A_{31} \\ A_{12} & A_{22} & A_{32} \\ A_{13} & A_{23} & A_{33} \end{bmatrix} = \begin{bmatrix} 1 & 1 & -1 \\ -3 & 1 & 1 \\ 9 & -5 & -1 \end{bmatrix}$$

$$\therefore \text{ A}^{-1} = \frac{AdjA}{|A|} = \frac{1}{2}\begin{bmatrix} 1 & 1 & -1 \\ -3 & 1 & 1 \\ 9 & -5 & -1 \end{bmatrix}$$

mÙkj 20- nh gb j[kk, $\frac{x-1}{-3} = \frac{y-2}{2k} = \frac{z-3}{z}$ ....(i)

RkFkk $\frac{x-1}{3k} = \frac{y-5}{1} = \frac{z-6}{-5}$ ....(i)

j[kk d (i) d fnd vUkqikkRk = –3, 2k, 2 $\Rightarrow a_1, b_1, c_1$

j[kk (ii) d fnd vUkqikkRk = 3k, 1, –5 $\Rightarrow a_2, b_2, c_2$

j[kk, (i) 0k (ii) lkjLlkj YkCkOkRk g Rkk lkfRkCk/k

$a_1a_2 + b_1b_2 + c_1c_2 = 0$

$\Rightarrow$ (–3) (3k) + (2k) (1) + 2 (–5) = 0

$\Rightarrow$ –9k + 2k – 10 = 0

$\Rightarrow$ –7k – 10 = 0

$\Rightarrow \quad -7k = 10$

$\Rightarrow \quad k = \dfrac{-10}{7}$

¼vFk0kk½

fn¸kk g& XkkYk dk LkEkhdj.k

$\Rightarrow \quad 5(x^2+y^2+z^2) + 10x - 6y + 8z + 5 = 0$

$\Rightarrow \quad x^2+y^2+z^2 + 2x - \dfrac{6}{5}y + \dfrac{8}{5}z + 5 = 0$

$u = 1,\ v = -3/5,\ w = 4/5,\ d = 1$

dæ ¾ $(-u, -v, -w)$ = ¼&1] $3/5\ -4/5$)

f«kT¸kk ¾ $\sqrt{u^2+v^2+w^2-d}$

¾ $\sqrt{1+9/25+16/25-1}$

¾ $\sqrt{25/25}$ ¾ $\sqrt{1}$ ¾ 1

mÙkj 21- fn¸kk g $y\sqrt{1-x^2}+x\sqrt{1-y^2}=1$ ....(i)

EkkUkk $x = \sin\theta$ and $y = \sin\phi$

put in eqn. (i)

$$\sin\phi\sqrt{1-\sin^2\theta}+\sin\theta\sqrt{1-\sin^2\phi}=1$$

$$\sin\phi\sqrt{\cos^2\theta}+\sin\theta\sqrt{\cos^2\phi}=1$$

$$\sin\phi\cos\theta+\sin\theta\cos\phi=1$$

$$\sin(\theta+\phi)=1$$

$$\theta+\phi=\sin^{-1}(1)$$

$$\sin^{-1}x+\sin^{-1}y=\sin^{-1}(1)$$

diff. w. r. to x

$$\frac{1}{\sqrt{1-x^2}}+\frac{1}{\sqrt{1-y^2}}\frac{dy}{dx}=0$$

$$\frac{1}{\sqrt{1-y^2}}\frac{dy}{dx}=-\frac{1}{\sqrt{1-x^2}}$$

$$\frac{dy}{dx} = -\frac{\sqrt{1-y^2}}{\sqrt{1-x^2}} \quad = \sqrt{\frac{1-y^2}{1-x^2}}$$

$$\therefore \qquad \frac{dy}{dx} + \sqrt{\frac{1-y^2}{1-x^2}} = 0$$

¼vFkok½

fn¸kk g ¸kfn $x = a(t + \sin t)$ ....(i)

vkj $y = a(1 - \cos t)$ ....(ii)

diff (i) and (ii) w.r. to t.

$$\frac{dx}{dt} = a(1 + \cos t) \qquad \text{..........(iii)}$$

and, $\frac{dy}{dt} = a(0 + \sin t) = a \sin t$ ....(iv)

LkEkhdj.k (iv) dk LkEkhdj.k (iii) Lk HkkXk nUk Ikj

$$\frac{dy}{dx} = \frac{a \sin t}{a(1 + \cos t)} = \frac{\sin t}{(1 + \cos t)} = \frac{2 \sin t/2 \cos t/2}{2 \cos^2 t/2}$$

$$= \frac{\sin t/2}{\cos t/2} = \tan t/2$$

mÙkj 22-

x	y	$x - \bar{x}$	$y - \bar{y}$	$(x-\bar{x})(y-\bar{y})$	$(x-\bar{x})^2$	$(y-\bar{y})^2$
65	67	&3	&2	6	9	4
66	68	&2	&1	2	4	1
67	66	&1	&3	3	1	9
68	69	0	0	0	0	0
69	72	1	3	3	1	9
70	72	2	3	6	4	9
71	69	3	0	0	0	9
$\sum x$ =476	$\sum y$ =483			$\sum (x-\bar{x})(y-\bar{y})$ = 20	$\sum (x-\bar{x})^2$ = 28	$\sum (y-\bar{y})^2$ = 32

$$\bar{x} = \frac{\sum x}{n} = \frac{476}{7} = 68$$

$$\bar{y} = \frac{\sum y}{n} = \frac{483}{7} = 69$$

$$r = \frac{\sum (x-\bar{x})(y-\bar{y})}{\sqrt{\sum (x-\bar{x})^2}\sqrt{\sum (y-\bar{y})^2}} = \frac{20}{\sqrt{28}\sqrt{32}} = \frac{20}{4\sqrt{56}}$$

$$\frac{5}{\sqrt{56}} = \frac{5}{2\sqrt{14}} = \frac{5}{2\times 3.74} = \frac{5}{7.48} = 0.67$$

¼vFkok½

nk regression line y on x RkFkk x on y ØEk'k%

$$y - m_y = r\frac{\sigma y}{\sigma x}(x - m_x) \qquad ....(i)$$

and $$y - m_x = r\frac{\sigma x}{\sigma y}(y - m_y) \qquad ....(ii)$$

j[kk (i) dh IkO.kRkk $m_1 = r\frac{\sigma y}{\sigma x}$

j[kk (ii) dh IkO.kRkk $m_2 = \frac{\sigma y}{r\sigma x}$

EkkUkk j[kkvk d CkhPk dk dk.k θ g Rkk]

$$\tan\theta = \frac{m_2 - m_1}{1 + m_1 m_2}$$

$$\tan\theta = \frac{\frac{\sigma y}{r\sigma x} - r\frac{\sigma y}{\sigma x}}{1 + \frac{\sigma y}{r\sigma x}r\frac{\sigma y}{\sigma x}} = \frac{\frac{\sigma y - r^2\sigma y}{r\sigma x}}{1 + \frac{\sigma y^2}{\sigma x^2}} = \frac{\frac{\sigma y}{\sigma x}\left(\frac{1-r^2}{r}\right)}{\left(\frac{\sigma x^2 + \sigma y^2}{\sigma x^2}\right)}$$

$$\tan\theta = \left(\frac{1-r^2}{r}\right)\frac{\sigma y}{\sigma x} \times \frac{\sigma x^2}{\left(\sigma x^2 + \sigma y^2\right)}$$

$$\therefore \left[\tan\theta = \left(\frac{1-r^2}{r}\right)\left(\frac{\sigma x \sigma y}{\sigma x^2 + \sigma y^2}\right)\right]$$

mRRkj 23- $I = \int \sec^3 x dx$ ....(i)

$$\sec x.\tan x - \int \sec x.\tan x.\tan x dx$$
$$\sec x.\tan x - \int \sec x.\tan^2 x.dx$$
$$\sec x.\tan x - \int \sec x.(\sec^2 x - 1).dx$$
$$\sec x.\tan x - \int (\sec^3 x - \sec x).dx$$
$$\sec x.\tan x - \int \sec^3 x dx + \int \sec x dx$$
$$I = \sec x.\tan x - \int \sec^3 x dx + \int \sec x dx$$
$$I = \sec x.\tan x - I + \log(\sec x + \tan x)dx$$
$$I + I = \sec x.\tan x + \log(\sec x + \tan x)$$
$$2I = \sec x.\tan x + \log(\sec x + \tan x)$$
$$I = \frac{1}{2}[\sec x.\tan x + \log(\sec x + \tan x)]$$

¼vFkOkk½

$I = \int \frac{x\sin^{-1} x}{\sqrt{1-x^2}} dx$ ....(i)

EkkUkk $x = \sin\theta]$ $dx = \cos\theta d\theta$

put in (i)

$$I = \int \frac{\sin\theta \sin^{-1}(\sin\theta)}{\sqrt{1-\sin^2\theta}}.\cos\theta d\theta$$

$$I = \int \frac{\sin\theta.\theta\cos\theta}{\cos\theta} d\theta = \int \theta \sin\theta d\theta$$

$$I = \theta \int \theta \sin\theta d\theta - \left[\frac{d}{d\theta}\int \theta \sin\theta d\theta\right] d\theta$$

$$I = \theta\cos\theta + \int 1.\cos\theta d\theta$$

$$I = -\sqrt{1-\sin^2\theta} + \sin\theta$$

$$I = -\sin^{-1}x\sqrt{1-x^2} + x$$

$$I = x - \sin^{-1}x\sqrt{1-x^2}$$

mÙkj 24- EkkUk fYk¸kk fd P RkFkk Q CkYkk dk Ikfj.kkEkh R g Rkk]

$$R^2 = P^2 + Q^2 + 2PQ\cos\alpha \quad \text{I}$$

IkFkEk fLFkfRk Ek

$$\left[(2m+1)\sqrt{P^2+Q^2}\right]^2 = P^2+Q^2+2PQ\cos\alpha$$

$$\Rightarrow \quad (2m+1)^2\left(P^2+Q^2\right) - \left(P^2+Q^2\right) = 2PQ\cos\alpha$$

$$\Rightarrow \quad \left[(2m+1)^2-1\right]\left(P^2+Q^2\right) = 2PQ\cos\alpha$$

$$\Rightarrow \quad (4m^2+4m)\left(P^2+Q^2\right) = 2PQ\cos\alpha$$

$$\Rightarrow \quad 4m(m+1)\left(P^2+Q^2\right) = 2PQ\cos\alpha \qquad ....(i)$$

f}Rkh¸k fLFkfRk Ek

$$\Rightarrow \quad (2m-1)^2\left(P^2+Q^2\right) = \left(P^2+Q^2\right) + 2PQ\cos\left(\frac{\pi}{2}-\alpha\right)$$

$$\Rightarrow \quad \left[(2m-1)^2-1\right]\left(P^2+Q^2\right) = 2PQ\sec\alpha$$

$$\Rightarrow \quad 4m(m-1)\left(P^2+Q^2\right) = 2PQ\sec\alpha \qquad ....(ii)$$

LkEkhdj.k (i) ,Ok (ii) Lk &&&&&

$$\Rightarrow \quad \frac{2PQ\sec\alpha}{2PQ\cos\alpha} = \frac{4m(m-1)\left(P^2+Q^2\right)}{4m(m+1)\left(P^2+Q^2\right)}$$

$$\Rightarrow \quad \frac{\sec\alpha}{\cos\alpha} = \frac{(m-1)}{(m+1)}$$

$$\Rightarrow \quad \tan\alpha = \frac{(m-1)}{(m+1)}$$

¼vFk0kk½

$a = 1,\ b = 4,\ n = 6,\ h = \dfrac{b-a}{n} = \dfrac{4-1}{6} = 3/6 = 1/2$

LkEkYkCk PkRkHkTkh¸k fUk¸kEk Lk]

$$\int_1^4 f(x)dx = \frac{h}{2}\left[(y_1 + y_2) + 2(y_2 + y_3 + y_4 + y_5 + y_6\right]$$

$$= \frac{1}{2\times 2}\left[(2+2.1) + 2(2.4+2.7+2.8+3+2.6)\right]$$

$$= \frac{1}{4}\left[(4.1) + 2(13.5)\right]$$

$$= \frac{1}{4}\left[4.1 + 27\right]$$

$$= \frac{31.1}{4} = 7.775$$ bdkbA

¼vFkOkk½

fn¸kk g& $f(x) = e^x$

x	$y = f(x) = e^x$	
0	1	y_1
1	2.72	y_2
2	7.39	y_3
3	20.09	y_4
4	54.60	y_5

$a = 0,\ b = 4,\ n = 4,\ h = \dfrac{b-a}{n} = \dfrac{4-0}{4} = 1$

$\therefore$ Simpson rule

$$\int_0^4 e^x dx = \frac{h}{3}\left[(y_1 + y_5) + 4(y_2 + y_4) + 2(y_3)\right]$$

$$= \frac{1}{3}\left[(1+54.60) + 4(2.72+20.09) + 2(7.39)\right]$$

$$= \frac{1}{3}\left[55.60 + 4(22.81) + 14.78\right]$$

$$= \frac{1}{3}[55.60 + 91.24 + 14.78]$$

$$= \frac{1}{3}[161.62] \quad = \quad 53.87$$

mÙkj 26- $I \quad = \quad \int_0^{\pi/4} \log(1+\tan x)dx \qquad ......(i)$

$$= \int_0^{\pi/4} \log\left[1+\tan\left(\frac{\pi}{4}-x\right)\right]dx$$

$$= \int_0^{\pi/4} \log\left[1+\frac{\tan\frac{\pi}{4}-\tan x}{1+\tan\frac{\pi}{4}.\tan x}\right]dx$$

$$= \int_0^{\pi/4} \log\left[1+\frac{1-\tan x}{1+\tan x}\right]dx$$

$$= \int_0^{\pi/4} \log\left[\frac{1+\tan x+1-\tan x}{1+\tan x}\right]dx$$

$$= \int_0^{\pi/4} \log\left[\frac{2}{1+\tan x}\right]dx$$

$$= \int_0^{\pi/4} \log 2dx - \int_0^{\pi/4} \log(1+\tan x)dx$$

$$I = \int_0^{\pi/4} \log 2dx - I \qquad \text{by (i)}$$

$$I+I = \int_0^{\pi/4} \log 2dx$$

$$2I = \log 2\int_0^{\pi/4} dx \quad = \quad \log 2(x)_0^{\pi/4} \quad = \quad \log 2\left(\pi/4 - 0\right)$$

$$2I = \pi/4 \log 2$$

$$I = \pi/8 \log 2$$

¼vFkokk½

fn¸kk g0Ø dk LkEkhdj.k $x^2 = 4y \qquad ....(i)$

RkFkk j[kk dk LkEkhdj.k $x = 4y - 2$ ....(ii)

LkEkhdj.k (i) 0k (ii) Lk

$$x^2 = x + 2$$

$$x^2 - x - 2 = 0$$

$$\Rightarrow \quad x = \frac{1 \pm \sqrt{1+8}}{2} = \frac{1 \pm 3}{2} = 2, -1$$

LkEkhdj.k (ii) Ek EkkUk j[kUk Ikj

¸kfn $x = 1$ Rkk $y = \frac{1}{4}$

¸kfn $x = 2$ Rkk $y = 1$

fCkn A RkFkk B d fUkn'kkd ØEk'k% A¼2] 1½ RkFkk B$\left(-1, \frac{1}{4}\right)$ gkXkA

vHkh"V {k«kQYk AOB

¾ $\int_1^2 \left[\left(\frac{x+2}{4}\right) - \left(\frac{x^2}{4}\right)\right] dx$

¾ $\int_1^2 \left[\frac{x}{4} + \frac{1}{2} - \frac{x^2}{4}\right] dx$

¾ $\left[\frac{1}{4}\frac{x^2}{2} + \frac{x}{2} - \frac{x^3}{12}\right]_{-1}^{2}$

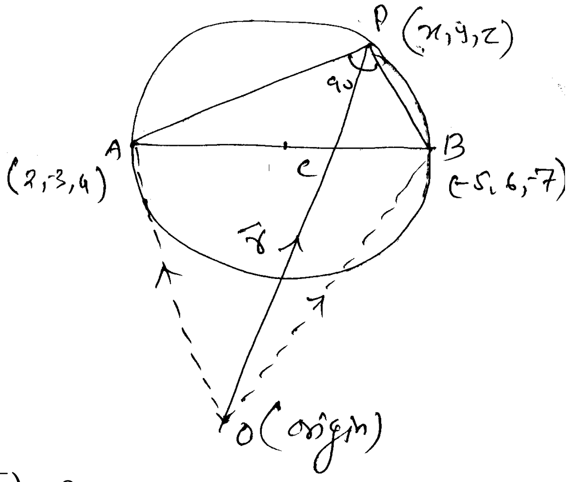
¾ $\left(\frac{x^2}{8} + \frac{x}{2} - \frac{x^3}{12}\right)_{-1}^{2}$ ¾ $\left[\left(\frac{4}{8} + \frac{2}{2} - \frac{8}{12}\right) - \left(\frac{1}{8} - \frac{1}{2} + \frac{1}{12}\right)\right]$

¾ $\left[\left(\frac{1}{2} + 1 - \frac{2}{3} - \frac{1}{8} + \frac{1}{2} - \frac{1}{12}\right) - \left(\frac{1}{8} - \frac{1}{2} - \frac{1}{12}\right)\right]$

¾ $2 - \frac{2}{3} - \frac{1}{8} - \frac{1}{12}$ ¾ $\frac{48 - 16 - 3 - 2}{24}$ ¾ $\frac{48 - 21}{24}$

¾ $\frac{27}{24}$ ¾ $\frac{9}{8}$ bdkb mÙkj

mÙkj 27 fn¸kk g AB XkkYk dk 0¸kkLk g fTkLkd fUkn 'kkd ØEk'k% ¼2]&3]4½ RkFkk &5]6]7½ g



EkkUkk O EkYk fCkn gA O d LkkIk{k A RkFkk B d fLFkfRk Lkfn'k ØEk'k%

$\bar{a} = 2i - 3j + 4k$

$\bar{b} = -5i + 6j - 7k]$ $\overline{OP} = \bar{r}$

XkkYk dk LkEkhdj.k $(\bar{r} - \bar{a}).(\bar{r} - \bar{b}) = 0$

$\Rightarrow \quad [\bar{r} - (2i - 3j + 4k)].[\bar{r} - (-5i + 6j - 7k)] = 0$

$\Rightarrow \quad [(\bar{r} - 2i + 3j - 4k)].[(\bar{r} + 5i - 6j + 7k)] = 0$ ....(i)

;g vHkh"V lehdj.k gA

XkkYk dk dkfRkdh¸k LkEkhdj.k]

$(x - x_1)(x - x_2) + (y - y_1)(y - y_2) + (z - z_1)(z - z_2) = 0$

$\Rightarrow \quad (x - 2)(x + 5) + (y + 3_1)(y - 6) + (z - 4)(z + -7) = 0$

$\Rightarrow \quad x^2 + y^2 + z^2 + 3x - 3y + 3z - 56 = 0$

LIk"VRk% bLk XkkYk dk dn $\left(-\frac{3}{2}, \frac{3}{2}, -\frac{3}{2}\right)$ gA

RkFkk f«kT¸kk $\sqrt{\frac{9}{4} + \frac{9}{4} + \frac{9}{4} + 56}$ = $\sqrt{\frac{251}{2}}$

¼vFkOkk½

fn¸kk g nk j[kkvk d LkEkhdj.k

$\bar{r} = (i + j) + t(2i - j + k)$ ....(i)

RkFkk $\bar{r} = (2i + j = k) + s(3i - 5j + 2x)$ ....(ii)

LkEkhdj.k (i) Lk

$\bar{a}_1 = i + j$ $\bar{b}_1 = 2i - j + k$

LkEkhdj.k (ii) Lk

$\bar{a}_2 = 2i + j - k$ $\bar{b}_2 = 3i - 5j + 2k$

$$\therefore \quad \bar{b}_1 \times \bar{b}_2 = \begin{vmatrix} i & j & k \\ 2 & -1 & 1 \\ 3 & -5 & 2 \end{vmatrix}$$

$$= i(-2 + 5) - j(4 - 3) + k(-10 + 3)$$

$$= 3i - j - 7k$$

$$|\bar{b}_1 \times \bar{b}_2| = \sqrt{9+1+49} = \sqrt{59}$$

$$\bar{a}_2 - \bar{a}_1 = (i + j - k) - (i + j)$$

$$= i - k$$

U¸kUkRkEk njh ¾ $\dfrac{\left[\bar{a}_2 - \bar{a}_1, \bar{b}_1 \times \bar{b}_2\right]}{|\bar{b}_1 \times \bar{b}_2|}$

¾ $\dfrac{(\bar{a}_2 - \bar{a})_1, (\bar{b}_1 \times \bar{b}_2)}{|\bar{b}_1 \times \bar{b}_2|}$

¾ $\dfrac{(i-k)_1, (3i - j - 7k)}{\sqrt{59}} = \dfrac{3+0+7}{\sqrt{59}}$

¾ $\dfrac{10}{\sqrt{59}}$ mÙkj A