Shri Maruthi Matric Hr. Sec School.

V. Madepalli - x - Road.

+2 Higer Secondary Quarterly Examination 2017-18

Maths - Answer key.

I. Choose it :-

Section - A

1. c 2. d 3. a 4. c 5. b 6. b 7. c 8. b 9. b 10. b 11. c 12. c

13. a 14. c 15. b 16. c 17. c 18. c 19. b 20. b 21. c 22. d 23. a

24. c 25. c 26. c 27. a 28. b 29. b 30. a 31. a 32. c 33. c 34. b

35. c 36. b 37. b 38. b 39. d 40. d.

Section - B

41.

$A = \begin{bmatrix} 1 & 2 \\ 3 & -5 \end{bmatrix}$

$|A| = \begin{vmatrix} 1 & 2 \\ 3 & -5 \end{vmatrix} = -5-6$

$= -11 \neq 0$

$A_{11} = -5$, $A_{12} = -3$, $A_{13} = -2$

$A_{14} = +1$

$[A_{ij}] = \begin{bmatrix} -5 & -3 \\ -2 & +1 \end{bmatrix}$

$\therefore \operatorname{adj} A = [A_{ij}]^T = \begin{bmatrix} -5 & -2 \\ -3 & 1 \end{bmatrix}$

$A(\operatorname{adj} A) = -11 \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$= |A|\, I \rightarrow (1)$

$\therefore (\operatorname{adj} A) A = -11 \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$= |A|\, I \rightarrow (2)$

from (1) & (2)

$A(\operatorname{adj} A) = (\operatorname{adj} A) A = |A| I$

42. Let

$\sim \begin{bmatrix} 1 & -2 & 3 & 4 \\ 0 & 0 & 5 & 5 \\ 0 & 0 & 10 & 10 \end{bmatrix} \begin{matrix} R_2 \to R_2 + 2R_1 \\ \\ R_3 \to R_3 + R_1 \end{matrix}$

$\sim \begin{bmatrix} 1 & -2 & 3 & 4 \\ 0 & 0 & 5 & 5 \\ 0 & 0 & 0 & 0 \end{bmatrix} R_3 \to R_3 - 2R_2$

last equivalent matrix in echelon form.

$\therefore \rho(A) = 2$

43.

Let $\vec{BC} = \vec{a}$, $\vec{CA} = \vec{b}$, $\vec{AB} = \vec{c}$

By Property;

$\frac{1}{2}|\vec{a} \times \vec{b}| = \frac{1}{2}|\vec{b} \times \vec{c}| = \frac{1}{2}|\vec{c} \times \vec{a}|$

$ab \sin(\pi - c) = bc \sin(\pi - A) = ca \sin(\pi - B)$

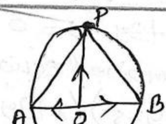
$ab \sin C = bc \sin A = ca \sin B$

$\frac{\sin C}{c} = \frac{\sin A}{a} = \frac{\sin B}{b}$

Take Reciprocals.

$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

44.



Let P be a point on surface sphere AB is diameter. Sphere passes through point P, A & B

Take centre O

$\vec{PB} = \vec{OB} - \vec{OP}$

$\vec{AP} = \vec{OP} - \vec{OA} = \vec{OP} + \vec{OB}$

$\vec{AP} \cdot \vec{PB} = |\vec{OB}|^2 - |\vec{OP}|^2$

$= 0$ since $(|\vec{OP}| = |\vec{OB}|)$

$\Rightarrow \angle APB = 90^\circ$

$\therefore$ AB subtends a right angle at P on the surface.

45.

(i) Let $\vec{a} = a_1\vec{i} + a_2\vec{j} + a_3\vec{k}$

$\vec{i} \times (\vec{a} \times \vec{i}) = (\vec{i} \cdot \vec{i})\vec{a} - (\vec{i} \cdot \vec{a})\vec{i}$

$= \vec{a} - a_1\vec{i}$

$\vec{j} \times (\vec{a} \times \vec{j}) = \vec{a} - a_2\vec{j}$

$\vec{k} \times (\vec{a} \times \vec{k}) = \vec{a} - a_3\vec{k}$

$L.H.S = 3\vec{a} - (a_1\vec{i} + a_2\vec{j} + a_3\vec{k})$

$= 3\vec{a} - \vec{a}$

$= 2\vec{a} = R.H.S.$

(ii)

The normal $\vec{n} = 3\vec{i} + 4\vec{j} + \vec{k}$

Parallel to line

$\vec{b} = 3\vec{i} - \vec{j} - 2\vec{k}$

Let θ be angle between line & plane.

$\sin\theta = \frac{\vec{b} \cdot \vec{n}}{|\vec{b}||\vec{n}|}$

$\vec{b} \cdot \vec{n} = (3)(3) + (-1)(4) + (-2)(1)$

$= 3$

$|\vec{b}| = 2$ $|\vec{n}| = \sqrt{91}$

$\sin\theta = \frac{3}{2\sqrt{91}}$ $\theta = \sin^{-1}\left(\frac{3}{2\sqrt{91}}\right)$

46) $Re\left(\frac{\bar{z}+1}{\bar{z}-i}\right)=0$

$z = x+iy$

$\bar{z} = x-iy$

$\frac{\bar{z}+1}{\bar{z}-i} = \frac{x-iy+1}{x-iy-i}$

$= \frac{(x-1)-iy}{x-i(y+1)} \times \frac{x+i(y+1)}{x+i(y+1)}$

$= \frac{x(x+1)+y(y+1)}{x^2+(y+1)^2} + i(I.P)$

$Re\left(\frac{\bar{z}+1}{\bar{z}-i}\right)=0$

$\frac{x(x+1)+y(y+1)}{x^2+(y+1)^2}=0$

$x(x+1)+y(y+1)=0$

$x^2+y^2+x+y=0$

locus of P is $x^2+y^2+x+y=0$.

47) Triangle inequality:

$|z_1+z_2| \le |z_1|+|z_2|$

proof: z_1 & z_2 two complex number. W.K.T

$|z_1+z_2|^2 = (z_1+z_2)(\overline{z_1+z_2})$ $\because |z|^2 = z\bar{z}$

$= (z_1+z_2)(\bar{z_1}+\bar{z_2})$

$= z_1\bar{z_1} + z_2\bar{z_2} + z_1\bar{z_2} + \bar{z_1}z$

$= |z_1|^2+|z_2|^2+2Re(z_1\bar{z_2})$

$\le |z_1|^2+|z_2|^2+2(|z_1\bar{z_2}|)$

$= |z_1|^2+|z_2|^2+2|z_1||z_2|$ $Re(z) \le |z|$

$= [|z_1|+|z_2|]^2$

$\le [|z_1|+|z_2|]^2$

$|z_1+z_2| \le |z_1|+|z_2|$ 4

48) $6x^4-25x^3+32x^2+3x-10=0$

One root $= 2-i$

another root $= 2+i$

Sum of the root $= 4$

Product of root $= 5$

$x^2-(\text{sum})x+\text{Prod}=0$

$x^2-4x+5=0$

$6x^4-25x^3+32x^2+3x-10 = (x^2-4x+5)(6x^2+Px-2)$

Equ x term

$5P+8=3$

$P=-1$

other factor $6x^2-x-2$

$\Rightarrow (2x+1)(3x-2)$

$x = 2/3$ (or) $-1/2$

$\therefore$ roots are $2\pm i, \frac{2}{3}, -\frac{1}{2}$

49) One of asymptotes

$3x-y-5=0$

other asymptotes

$-x-3y+k=0$

Centre $(2,1)$

$x+3y-5=0$

$\therefore$ combined equation

$(3x-y-5)(x+3y-5)=0$

Equation of Rectangular hyperbola.

$(3x-y-5)(x+3y-5)+k=0$

Point $(1,-1)$

$\therefore k=-7$

$\therefore$ Equation required rectangular hyperbola is

$(3x-y-5)(x+3y-5)-7=0$ 4

50) (i) The equation of form

$(y-k)^2 = 4a(x-h)$

$V(1,2)$ $\therefore F(3,2)$

$VF = a = 2$

$(y-2)^2 = 4(2)(x-1)$

$(y-2)^2 = 8(x-1)$

(ii) The equ of chord of contact of tangents from (x_1,y_1)

$2x^2+5y^2=20$

$2xx_1+5yy_1-20=0$

$(2,4)$

$2x(2)+5y(4)=20$

$x+5y-5=0$

51) $F = \frac{5}{x}+100x$

$F'(x) = \frac{-5}{x^2}+100$

$F''(x) = \frac{10}{x^3}$

$F'(x)=0 \Rightarrow 100x^2-5=0$ $\Rightarrow$ minimum

$x = \pm 1/\sqrt{20}$

$= \pm \frac{1}{2\sqrt{5}}$

$\therefore x = \frac{1}{2\sqrt{5}}$

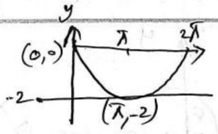
$F''(x) = \frac{100}{(1/2\sqrt{5})^3} > 0$

$F = 5(2\sqrt{5}) + 100 \times \frac{1}{2\sqrt{5}}$

$= 10\sqrt{5}+10\sqrt{5}$

$= 20\sqrt{5}$ 4

(52)



$f(x)$ is continuous $[0,2\pi]$

$f(x)$ is differentiable $(0,2\pi)$

$f(0)=0=f(2\pi)$ satisfying

$f'(x) = -\sin x = 0$

$\sin x = 0$

$x = 0, \pi, 2\pi, \ldots$

$x=\pi$ required c in $(0,2\pi)$

At $x=\pi$,

$y = -1+\cos\pi = -2$

$\therefore$ Point $(\pi,-2)$ is tangent to the curve $\parallel$ to x-axis

(53) Consider the difference

$f(x) = (1+x)^n - (1+nx)$

$f'(x) = n(1+x)^{n-1} - n$

$= n\left[(1+x)^{n-1} - 1\right]$

Since $x>0$ & $n-1>0$

we have.

$(1+x)^{n-1} > 1$, so $f'(x) > 0$

f is strictly increasing $[0,\infty)$

$x>0 \Rightarrow f(x) > f(0)$

$\therefore (1+x)^n - (1+nx) > (1+0) - (1+0)$

$\therefore (1+x)^n > (1+nx)$.

(54) $T = K\sqrt{l}$

$\log T = \log K + \frac{1}{2}\log l$

$\frac{\Delta T}{T} \approx \frac{1}{T}dT = 0 + \frac{1}{2}\cdot\frac{1}{l}\times dl$

$\frac{\Delta T}{T}\times 100 = \frac{1}{2}\times\frac{dl}{l}\times 100$

$= \frac{1}{2}\times\frac{(-0.1)}{32.1}\times 100$

$= -0.156\%$.

$\therefore$ Percentage error time of swing is decrease of 0.156.

(55) (a) $\Delta = \begin{vmatrix} 2 & 3 \\ 4 & 6 \end{vmatrix} = 12-12 = 0$

$\Delta_x = \begin{vmatrix} 8 & 3 \\ 16 & 6 \end{vmatrix} = 48-48 = 0$

$\Delta_y = \begin{vmatrix} 2 & 8 \\ 4 & 16 \end{vmatrix} = 32-32 = 0$

Since $\Delta=0$, & $\Delta_x = \Delta_y = 0$.

Suppose $x = t$ in (1) equn

$y = \frac{1}{3}(8-2t)$

$\therefore (x,y) = \left(t, \frac{8-2t}{3}\right), t\in R$

$\therefore (x,y) = (1,2)$ for $t=1$

$(x,y) = (-2,4)$ for $t=-2$

$(x,y) = (-\frac{1}{2},3)$ for $t = -\frac{1}{2}$

(b) $u = xy^2\sin(x/y)$

$u(tx,ty) = t^3xy^2\sin(x/y)$

$\Rightarrow u$ is homogeneous function degree 3.

$\therefore$ Euler theorem.

$x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 3u$.

Longer Section – C

(56) $AX=B$

$X = A^{-1}B$

$|A| = \begin{vmatrix} 2 & -1 & 1 \\ 3 & 1 & -5 \\ 1 & 1 & 1 \end{vmatrix} = 22 \neq 0$

$[A_{ij}]^T = \text{adj}A = \begin{bmatrix} 6 & 2 & 4 \\ -8 & 1 & 13 \\ 2 & -3 & 5 \end{bmatrix}$

$A^{-1} = \frac{1}{|A|}\text{adj}A$

$X = \frac{1}{22}\begin{bmatrix} 88 \\ 22 \\ 0 \end{bmatrix}$

$\Rightarrow \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 4 \\ 1 \\ 0 \end{bmatrix}$

Solution $x=4$ $y=1$ $z=0$.

(57) $AX=B$

$[A,B] = \begin{bmatrix} 1 & 1 & 3 & 0 \\ 4 & 3 & \mu & 0 \\ 2 & 1 & 2 & 0 \end{bmatrix}$

$\sim \begin{bmatrix} 1 & 1 & 3 & 0 \\ 0 & -1 & \mu-12 & 0 \\ 0 & -1 & -4 & 0 \end{bmatrix}$ R_2-4R_1, R_3-2R_1

$\sim \begin{bmatrix} 1 & 1 & 3 & 0 \\ 0 & -1 & \mu-12 & 0 \\ 0 & 0 & 8-\mu & 0 \end{bmatrix}$ R_3-R_2

case (i) $\mu\neq 8$ the $8-\mu \neq$

$\therefore \rho(A) = \rho(A,B) = 3$

$\therefore x=0$, $y=0$, $z=0$

case (ii) $\mu=8$

$\rho(A,B)=2$ $\rho(A)=2$

$\therefore \rho(A)=\rho(A,B)=2 <$ unknowns

$x+y+3z=0$

$y+4z=0$ $(x=2z)$

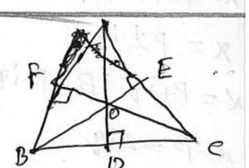
$y=-4z$

$\therefore z=k$

$y=-4k$, $z=k$ $[k\in R-\{0\}]$

$\therefore$ non-trivial solution

(58)



$\vec{OA} = \vec{a}$ $\vec{OB} = \vec{b}$ $\vec{OC} = \vec{c}$

$\vec{OA} \perp \vec{BC} \Rightarrow \vec{a}\cdot\vec{c} - \vec{a}\cdot\vec{b} = 0$

$\vec{OB} \perp \vec{CA} = \vec{b}\cdot\vec{a} - \vec{b}\cdot\vec{c} = 0$

$(\vec{a}-\vec{b})\cdot\vec{c} = 0$

$\vec{BA}\cdot\vec{OC} = 0$

$\Rightarrow BA \perp CF$.

(59) $(x_1,y_1,z_1) = (1,-1,0)$

$(x_2,y_2,z_2) = (2,1,-1)$

$(l_1,m_1,n_1) = (1,-1,3)$

$(l_2,m_2,n_2) = (1,2,-1)$

$[(\vec{a_2}-\vec{a_1})\,\vec{u}\,\vec{v}] = 0$

$$\begin{vmatrix} 1 & 2 & -1 \\ 1 & -1 & 3 \\ 1 & 2 & -1 \end{vmatrix} = 0$$

$\vec{u}$ & $\vec{v}$ - இணை அல்ல

வெட்டும் கோடுகள்

$\frac{x-1}{1} = \frac{y+1}{-1} = \frac{z}{3} = \lambda$

$\Rightarrow (\lambda-1, \lambda-1, 3\lambda)$

$\frac{x-2}{1} = \frac{y-1}{2} = \frac{-z-1}{1} = \mu$

$\Rightarrow (\mu+2, 2\mu+1, -\mu-1)$

$\lambda = 0,\ \mu = -1$

வெட்டும் புள்ளி $(1,-1,0)$.

(60) $x^2-2px+(p^2+q^2)=0$

$x = p \pm iq$

$\alpha = p+iq$; $\beta = p-iq$

$\alpha-\beta = 2iq$

$y = \frac{q\cos\theta}{\sin\theta} - p$

$(y+\alpha)^n = \frac{q^n}{\sin^n\theta}(\cos n\theta + i\sin n\theta)$

$(y+\beta)^n = \frac{q^n}{\sin^n\theta}(\cos n\theta - i\sin n\theta)$

$(y+\alpha)^n - (y+\beta)^n = \frac{q^n}{\sin^n\theta}(2i\sin n\theta)$

$\frac{(y+\alpha)^n - (y+\beta)^n}{\alpha-\beta} = q^{n-1}\frac{\sin n\theta}{\sin^n\theta}$.

(61) $x^9+x^5-x^4-1=0$

$(x^5-1)(x^4+1)=0$

$(x^5-1)=0 \Rightarrow x = (1)^{1/5}$

$x = (\text{cis}\,0)^{1/5}$

$= \text{cis}\,(2k\pi+0)^{1/5}$

$k = 0,1,2,3,4$

$x = \text{cis}(0),\ \text{cis}(2\pi/5),\ \text{cis}\left(\frac{4\pi}{5}\right)$

$\text{cis}\left(\frac{6\pi}{5}\right)\ \text{cis}\left(\frac{7\pi}{5}\right)$

$(x^4+1)=0 \Rightarrow x = (-1)^{1/4}$

$x = (\text{cis}\,\pi)^{1/4}$

$= \text{cis}\,(2k\pi+\pi)^{1/4}$

$k = 0,1,2,3$

$x = \text{cis}\left(\frac{2k\pi+\pi}{4}\right),\ k = 0,1,2,3$

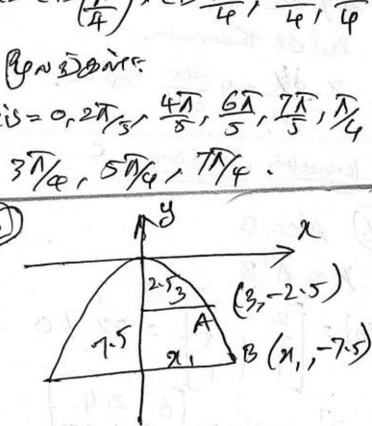
$x = \text{cis}\left(\frac{\pi}{4}\right),\ \text{cis}\,\frac{3\pi}{4},\ \frac{5\pi}{4},\ \frac{7\pi}{4}$

மூலங்கள்

$\text{cis} = 0, 2\pi/5, \frac{4\pi}{5}, \frac{6\pi}{5}, \frac{7\pi}{5}, \pi/4,$

$3\pi/4, 5\pi/4, 7\pi/4$.

(62)



$x^2 = -4ay$

$(3,-2.5) \Rightarrow 3^2 = -4a(-2.5)$

$a = 9/10$

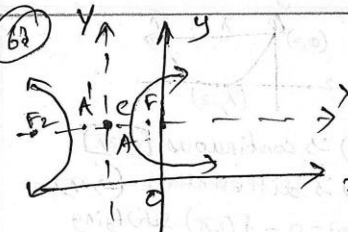
$x^2 = -4 \times \frac{9}{10} \times y$

$P(x_1, -7.5)$

$\Rightarrow x_1^2 = -4 \times \frac{9}{10}(-7.5)$

$x_1 = 3\sqrt{3}$ m

(63)



$\frac{(x+3)^2}{4} - \frac{(y-2)^2}{1} = 1$

$a^2 = 16 \Rightarrow a=4 \quad b=3$

$e = \sqrt{\frac{a^2+b^2}{a^2}} \Rightarrow e = \sqrt{5}/2$

மையம்	(0,0)	C(−3, 2)
குவியங்கள்	$F_1(ae,0)$ $F_2(-ae,0)$	$F_1 = (\sqrt{5}-3, 2)$ $F_2(-\sqrt{5}-3, 2)$
முனைகள்	$A(a,0)$ $A(-a,0)$	$A(-1,2)$ $A(-5,2)$

(64) $y = mx+c$

Hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

$c^2 = a^2m^2 - b^2$

$3x - y = 5$

$y = -5 + 3x$

$m = 3$ $\quad$ $c = -5$

$2x^2 - 3y^2 = 6$

$\frac{x^2}{3} - \frac{y^2}{2} = 1$ $\quad$ $a^2 = 3$ $\quad$ $b^2 = 2$

$c^2 = 25$

$a^2m^2 - b^2 = 3(9) - 4$

$= 27 - 4$

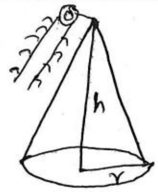
$= 23$

$\left(\frac{-a^2m}{c}, -\frac{b^2}{c}\right) = \left(\frac{-9}{5}, \frac{4}{-5}\right)$

$\therefore$ Point of Contact

$\left(-9/5, -4/5\right)$

(65)



Let r, h denote base radius & height of cone of volume V, at time t min.

W.K.T $2r = h$

$\frac{dV}{dt} = 30\,ft^3/min$

To find: $\frac{dh}{dt}$

$h = 10$ ft

$V = \frac{1}{3} h \pi r^2$

$V = \frac{\pi}{12} h^3$

$\frac{dV}{dt} = \frac{\pi}{12} \times 3h^2 \frac{dh}{dt}$

$= \frac{6}{5\pi}$ ft/min

Height of cone is increasing at rate $\frac{6}{5\pi}$ ft/min.

(66) $f(x) = x - 2\sin x, \ [0, 2\pi]$

$f'(x) = 1 - 2\cos x$

$f'(x) = 0$

$\cos x = \frac{1}{2} \Rightarrow x = \frac{\pi}{3}$ (or) $\frac{5\pi}{3}$

$f\left(\frac{\pi}{3}\right) = \frac{\pi}{3} - 2\sin\frac{\pi}{3}$

$= \frac{\pi}{3} - \sqrt{3}$

$f\left(\frac{5\pi}{3}\right) = \frac{5\pi}{3} - 2\sin\frac{5\pi}{3}$

$= \frac{5\pi}{3} + \sqrt{3}$

$\simeq 6.968039$

$\therefore f(0) = 0 \quad f(2\pi) = 2\pi \simeq 6.28$

$f(\pi/3) = \frac{\pi}{3} - \sqrt{3}$

$f\left(\frac{5\pi}{3}\right) = \frac{5\pi}{3} + \sqrt{3}$

(67) $y = 12x^2 - 2x^3 - x^4$

$y' = 24x - 6x^2 - 4x^3$

$y'' = 24 - 12x - 12x^2$

$= -12(x-1)(x+2)$

$y'' = 0 \Rightarrow x = 1$ (or) -2

$-\infty \quad -2 \quad 1 \quad \infty$

When $x < -2$ say $x = -3$

$y'' = -12(-4)(-1) < 0$

concave doward in $(-\infty, 2)$

When $-2 < x < +1$ say $x = 0$

$y''(0) = -12(0-1)(0+2)$

$= 24 > 0$

concave upwards $(-2, 1)$

when $1 < x < \infty$ say $x = 2$

$y''(2) = -12(2-1)(2+2)$

$= -12(1)(4) < 0$

concave downward $(1, \infty)$

$x = -2$ neither concave up & nor down.

$y(-2) = 48$

$(-2, 48)$

$y(1) = 9 : (1, 9)$

∴ Point inflexion are $(-2, 48)$ & $(1, 9)$.

(68)

$\frac{\partial w}{\partial x} = \frac{\partial w}{\partial u}\frac{\partial u}{\partial x} + \frac{\partial w}{\partial v}\cdot\frac{\partial v}{\partial x}$

$\frac{\partial w}{\partial y} = \frac{\partial w}{\partial u}\cdot\frac{\partial u}{\partial y} + \frac{\partial w}{\partial v}\cdot\frac{\partial v}{\partial y}$

$\frac{\partial w}{\partial u} = 2ue^v \quad \frac{\partial w}{\partial v} = u^2 e^v$

$\frac{\partial u}{\partial x} = \frac{1}{y} \quad \frac{\partial u}{\partial y} = \frac{-x}{y^2}$

$\frac{\partial v}{\partial x} = \frac{y}{x} \quad \frac{\partial v}{\partial y} = \log x$

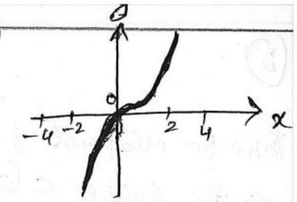
$\therefore \frac{\partial w}{\partial x} = \frac{2ue^v}{y} + u^2 e^v \frac{y}{x}$

$= x^y \frac{x}{y^2}(2+y)$

$\therefore \frac{\partial w}{\partial y} = 2ue^v \frac{-x}{y^2} + u^2 e^v \log x$

$= x^2/y^3 \ x^y (y \log x - 2)$

(69)



(i) Domain $(-\infty, \infty)$

(ii) Horizonal $-\infty < x < \infty$

Vertical $-\infty < y < \infty$

(iii) It is Symmetrical about origin

(iv) The curve does not admit any asymptote

(v) monotonicity:

$y' \geq 0 \ \forall x$

increasing $(-\infty, \infty)$

(vi) special points

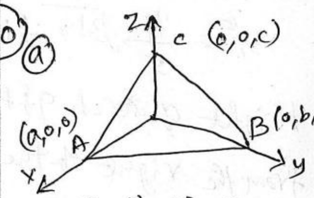
$y'' = 6x \ (0, \infty)$ - concave

convex $(-\infty, 0)$

$y''(0)$ for $x = 0$ $(0, 0)$

x	-1	0	1	2
y	-1	0	1	8

(70) (a)



$\vec{a} = a\vec{i} \quad \vec{b} = b\vec{j} \quad \vec{c} = c\vec{k}$

$\vec{r} = (1-s-t)\vec{a} + s\vec{b} + t\vec{c}$

$\frac{x}{a} = 1-s-t, \ \frac{y}{b} = s, \ \frac{z}{c} = t$

$\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$

$(x_1, y_1, z_1) = (a, 0, 0)$

$(x_2, y_2, z_2) = (0, b, 0)$

$(x_3, y_3, z_3) = (0, 0, c)$

$\begin{vmatrix} x-a & y-0 & z-0 \\ -a & b-0 & 0 \\ -a & 0 & c-0 \end{vmatrix} = 0$

$\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$

(b)

Take the midpoint of base as the Centre $C(0,0)$.

Since base 40ft vertices A & A' are $(20,0)$ & $(-20,0)$

$2a = 40 \quad b = 16$

$a = 20$

$$\frac{x^2}{400} + \frac{y^2}{256} = 1$$

y_1 be height arch 9ft

$\therefore (9, y_1)$ is point equation

$$\therefore \frac{9^2}{400} + \frac{y_1^2}{256} = 1$$

$$\frac{y_1^2}{256} = 1 - \frac{81}{400}$$

$$y_1 = \frac{4}{5}\sqrt{319} \text{ ft}$$

Height of arch 9ft from the right of the centre $\frac{4}{5}\sqrt{319}$ ft.

S. Balakrishnan M.Sc. B.ed