WAY TO SUCCESS PUBLICATIONS

12^{th} Maths - Answer key -

Public Exam - 2020

Part - I

1. (3) 2×4 EX. 8.8 (3)
2. (4) N EX 12.3 (2)
3. (3) $\frac{3\pi}{8}$ EX. 9.10 (13)
4. (1) exactly n roots EX. 3.7 (3)
5. (3) consistent EX. 1.8 (21)
6. (4) $(0, \frac{1}{8})$ PTA
7. (3) $\pi/3$ EX. 4.6 (2)
8. (2) $1+i$ EX. 2.9 (2)
9. (3) xoy plane creative
10. (3) 3 EX. 10.9 (4)
11. (4) undefined creative
12. (1) $\tan^{-1}(\frac{1}{2})$ EX. 4.6 (10)
13. (3) $t = \frac{1}{3}$ EX. 7.10 (3)
14. (4) 40 creative
15. (1) 2 EX. 11.6 (5)
16. (4) $\sqrt{10}$ EX. 5.6 (5)
17. (2) $\frac{\sqrt{7}}{2\sqrt{2}}$ EX. 6.10 (20)
18. (2) $\begin{bmatrix} 2 & -5 \\ -3 & 8 \end{bmatrix}$ EX. 1.8 (10)
19. (2) $\pi/6$ EX. 9.10 (1)
20. (2) 1, 2 creative

Part - II

21. Example 2.4

$$\frac{1+i}{1-i} = \frac{1+i}{1-i} \times \frac{1+i}{1+i} = \frac{1+2i-1}{1+1} = \frac{2i}{2} = i$$

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

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

22. EX. 2.9 (18)

$(1+i)(1+2i)(1+3i)\dots(1+ni) = x+iy$

Taking modulus on both side

$$|1+i||1+2i||1+3i|\dots|1+ni| = |x+iy|$$

$$\sqrt{1+1}\sqrt{1+4}\sqrt{1+9}\dots\sqrt{1+n^2} = \sqrt{x^2+y^2}$$

$$\sqrt{2}\sqrt{5}\sqrt{10}\dots\sqrt{1+n^2} = \sqrt{x^2+y^2}$$

squaring on both side

$$2.5.10\dots(1+n^2) = x^2+y^2$$

23. Ex. 4.1 (ii)

$$\sin^{-1}\left(\sin\left(\frac{5\pi}{4}\right)\right) = \sin^{-1}\left(\sin\left(\pi+\frac{\pi}{4}\right)\right)$$

since $5\pi/4 \notin [-\pi/2, \pi/2]$

$$= \sin^{-1}(\sin(-\pi/4))$$

$$= -\pi/4 \quad \because (-\pi/4 \in [-\pi/2, \pi/2])$$

24. $A(2,0,-1)$, $\vec{OA} = 2\hat{i} - \hat{k}$

$\vec{r} = \vec{AO} = -2\hat{i} + \hat{k}$

$\vec{F} = 2\hat{i} + \hat{j} - \hat{k}$

Example 6.11

$\vec{t} = \vec{r} \times \vec{F}$

$$= \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ -2 & 0 & 1 \\ 2 & 1 & -1 \end{vmatrix}$$

$$= -\hat{i} - 2\hat{k}$$

Magnitude $= |-\hat{i} - 2\hat{k}| = \sqrt{5}$

Direction cosines $-\frac{1}{\sqrt{5}}, 0, -\frac{2}{\sqrt{5}}$

---

25. Example 7.20

$f(x)$ is continuous in $[\frac{1}{2}, 2]$

$f(x)$ is differentiable in $(\frac{1}{2}, 2)$.

with $f(\frac{1}{2}) = \frac{5}{2} = f(2)$

By Rolles theorem, there must exist $a\ c \in (\frac{1}{2}, 2)$

$f'(c) = 1 - \frac{1}{c^2} = 0$

$\Rightarrow c^2 = 1$ gives $c = \pm 1$

As $1 \in (\frac{1}{2}, 2)$, we choose $c = 1$

---

26. EX. 8.2 2(i)

$f(x) = x^2 + 3x$

$f'(x) = 2x + 3$

$df = f'(x)\,dx$

$= (2x+3)\,dx$

when $x = 2$, $dx = 0.1$

$df = [2(2)+3](0.1) = 0.7$

---

27. Creative

Let $I = \int_0^{\pi/2} \frac{f(\sin x)}{f(\sin x) + f(\cos x)}\,dx \rightarrow (1)$

$$= \int_0^{\pi/2} \frac{f(\sin(\pi/2 - x))}{f(\sin(\pi/2 - x)) + f(\cos(\pi/2 - x))}\,dx$$

$I = \int_0^{\pi/2} \frac{f(\cos x)}{f(\cos x) + f(\sin x)}\,dx \rightarrow (2)$

From (1), (2)

$$2I = \int_0^{\pi/2} \frac{f(\sin x) + f(\cos x)}{f(\cos x) + f(\sin x)}\,dx$$

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

$$2I = [x]_0^{\pi/2}$$

$$2I = \pi/2$$

$$I = \pi/4$$

---

28. Example 10.5

$y^2 = 4ax \rightarrow (1)$

Diff. w.r.to x

$2y\frac{dy}{dx} = 4a$

$a = \frac{y}{2}\frac{dy}{dx}$

sub 'a' value in (1) an

$y^2 = 4\left(\frac{y}{2}\frac{dy}{dx}\right)x$

$\frac{dy}{dx} = \frac{y}{2x}$

---

29. Theorem 12.1

$(S, *)$ be an algebraic structure suppose that e_1, e_2 be any two ~~el ele~~ identity elements of S.

First, $e_1 \Rightarrow$ identity, $e_2 \Rightarrow$ arbitrary element

By identity property

$e_2 * e_1 = e_1 * e_2 = e_2 \rightarrow (1)$

Interchanging the role of e_1 and e_2

$e_1 * e_2 = e_2 * e_1 = e_1 \rightarrow (2)$

From (1), (2)

$e_1 = e_2$

Hence, identity element is unique.

30. Open leftward

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

vertex $(h,k) = (2,1)$

$(y-1)^2 = -4a(x-2) \rightarrow (1)$ $\quad \begin{array}{l} h=2 \\ k=1 \end{array}$

It passes through $(1,3)$

$(3-1)^2 = -4a(1-2)$

$2^2 = -4a(-1)$

$4 = 4a$

$\boxed{a=1}$

Creative

sub in (1)

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

$y^2 - 2y + 1 = -4x + 8$

$y^2 - 2y + 4x - 7 = 0$ is the required equation

Part-III

31. $|A| = 5$

$A^{-1} = \frac{1}{5}\begin{bmatrix} 7 & -9 \\ -1 & 2 \end{bmatrix} = \begin{bmatrix} 7/5 & -9/5 \\ -1/5 & 2/5 \end{bmatrix}$

$(A^{-1})^T = \begin{bmatrix} 7/5 & -1/5 \\ -9/5 & 2/5 \end{bmatrix} = \frac{1}{5}\begin{bmatrix} 7 & -1 \\ -9 & 2 \end{bmatrix} \rightarrow (1)$

Example 1.8

$A^T = \begin{bmatrix} 2 & 1 \\ 9 & 7 \end{bmatrix}$

$|A^T| = 5$

$(A^T)^{-1} = \frac{1}{5}\begin{bmatrix} 7 & -1 \\ -9 & 2 \end{bmatrix} \rightarrow (2)$

From (1), (2)

$(A^{-1})^T = (A^T)^{-1}$

32. $\Delta = (4P)^2 - 4(4)(P+2)$

$= 16(P^2 - P - 2)$

$= 16(P+1)(P-2)$

$\Delta < 0$ if $-1 < P < 2$

$\Delta = 0$ if $P = -1$, or $P = 2$

$\Delta > 0$, if $-\infty < P < -1$ or $2 < P < \infty$

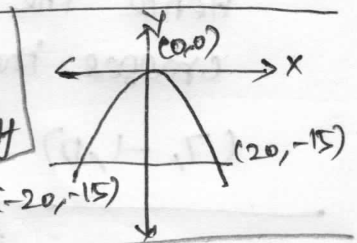
Example 3.7

Thus the given polynomial has imaginary roots if $-1 < P < 2$

equal real roots if $P = -1$ or $P = 2$

distinct real roots if $-\infty < P < -1$ or $2 < P < \infty$

33. Equation of parabola $x^2 = -4ay$



$(-20,-15)$ and $(20,-15)$ lie on parabola,

Example 5.32

$20^2 = -4a(-15)$

$4a = \frac{400}{15}$

$x^2 = -\frac{80}{3} \times y$

Required equation is

$3x^2 = -80y$

34. Direction ratios of the straight line joining these two points are 18, -12, 6. That is 3, -2, 1

so, the straight line is parallel to $3\hat{i} - 2\hat{j} + \hat{k}$

Vector Equation:

$\vec{r} = (-5\hat{i} + 7\hat{j} - 4\hat{k}) + t(3\hat{i} - 2\hat{j} + \hat{k})$ or

$= (13\hat{i} - 5\hat{j} + 2\hat{k}) + s(3\hat{i} - 2\hat{j} + \hat{k})$

$s, t \in R$

Example 6.27

Cartesian equation

$\frac{x+5}{3} = \frac{y-7}{-2} = \frac{z+4}{1}$ or

$\frac{x-13}{3} = \frac{y+5}{-2} = \frac{z-2}{1}$

An arbitrary point on the straight line is of the form

~~(3t-5)~~.

$(3t-5, -2t+7, t-4)$ or

$(3s+13, -2s-5, s+2)$

Since the straight line crosses xy plane, the z coordinate of the point of intersection is zero

$t-4=0, \Rightarrow t=4$

Hence the straight line crosses the xy plane at

$(7, -1, 0)$

---

35. $f'(x) = x^{4/5}\, 2(x-4) + (x-4)^2 \frac{4}{5} x^{-1/5}$

Creative

$f'(x) = \frac{(x-4)}{5x^{1/5}}(14x+6)$

$f'(x)=0$

$\Rightarrow x = 4, 8/7$

$f'(x)$ does not exist at $x=0$

critical numbers are $0, 4, 8/7$

---

36. $\frac{\partial U}{\partial x} = \frac{3x^2}{x^3+y^3+z^3}$

Ex. 8.4 (4)

$\frac{\partial U}{\partial y} = \frac{3y^2}{x^3+y^3+z^3}$

$\frac{\partial U}{\partial z} = \frac{3z^2}{x^3+y^3+z^3}$

$\therefore \frac{\partial U}{\partial x}+\frac{\partial U}{\partial y}+\frac{\partial U}{\partial z} = \frac{3(x^2+y^2+z^2)}{x^3+y^3+z^3}$

---

37. Given function is P.M.f

Example 11.10 (i)

$\Sigma f(x) = 1$

$k+2k+6k+5k+6k+10k=1$

$30k=1$

$k = 1/30$

PMF is

x	1	2	3	4	5	6
f(x)	1/30	2/30	6/30	5/30	6/30	10/30

$P(2<X<6) = f(3)+f(4)+f(5)$

$= \frac{6}{30}+\frac{5}{30}+\frac{6}{30}$

$= \frac{17}{30}$

---

38. $f(x)$ is a pdf $\int_{-\infty}^{\infty} f(x)dx = 1$

Creative

$\int_0^1 kx(1-x)^{10} dx = 1$

$\int_0^1 k(1-x)[1-(1-x)]^{10} dx = 1$

$k\int_0^1 (1-x)x^{10} dx = 1$

$k\int_0^1 (x^{10}-x^{11}) dx = 1$

$k\left[\frac{x^{11}}{11} - \frac{x^{12}}{12}\right]_0^1 = 1$

$k\left[\frac{1}{11}-\frac{1}{12}\right] = 1$

$\boxed{K=132}$

39.

Example 12.A

p	q	¬p	p→q	¬p∨q
T	T	F	T	T
T	F	F	F	F
F	T	T	T	T
F	F	T	F	T

The entries in the columns p→q and ¬p∨q are identical. They are equivalent

40. $\vec{a} = x_1\hat{i} + y_1\hat{j} + z_1\hat{k}$

$\vec{b} = x_2\hat{i} + y_2\hat{j} + z_2\hat{k}$

$\vec{u} = l_1\hat{i} + m_1\hat{j} + n_1\hat{k}$

$\vec{v} = l_2\hat{i} + m_2\hat{j} + n_2\hat{k}$

Vector equation: Either $\vec{a}$ or $\vec{b}$ and two parallel vectors $\vec{u}, \vec{v}$

$\vec{r} = \vec{a} + s\vec{u} + t\vec{v}$

Cartesian equation

Creative

Type 1: 1 point, 2 parallel vectors

$$\begin{vmatrix} x-x_1 & y-y_1 & z-z_1 \\ l_1 & m_1 & n_1 \\ l_2 & m_2 & n_2 \end{vmatrix} = 0$$

(or)

$$\begin{vmatrix} x-x_2 & y-y_2 & z-z_2 \\ l_1 & m_1 & n_1 \\ l_2 & m_2 & n_2 \end{vmatrix} = 0$$

Type 2: 2 points, 1 parallel vector

$$\begin{vmatrix} x-x_1 & y-y_1 & z-z_1 \\ x_2-x_1 & y_2-y_1 & z_2-z_1 \\ l_1 & m_1 & n_1 \end{vmatrix} = 0$$

(or)

$$\begin{vmatrix} x-x_1 & y-y_1 & z-z_1 \\ x_2-x_1 & y_2-y_1 & z_2-z_1 \\ l_2 & m_2 & n_2 \end{vmatrix} = 0$$

Part - IV

41. a)

$$[A|B] = \left[\begin{array}{ccc|c} 1 & -1 & 1 & -9 \\ 2 & -1 & 1 & 4 \\ 3 & -1 & 1 & 6 \\ 4 & -1 & 2 & 7 \end{array}\right]$$

$$= \left[\begin{array}{ccc|c} 1 & -1 & 1 & -9 \\ 0 & 1 & -1 & 22 \\ 0 & 2 & -2 & 33 \\ 0 & 3 & -2 & 43 \end{array}\right] \begin{array}{l} R_2 \to R_2 - 2R_1 \\ R_3 \to R_3 - 3R_1 \\ R_4 \to R_4 - 4R_1 \end{array}$$

Example 1.32

$$= \left[\begin{array}{ccc|c} 1 & -1 & 1 & -9 \\ 0 & 1 & -1 & 22 \\ 0 & 0 & 0 & -11 \\ 0 & 0 & 1 & -23 \end{array}\right] \begin{array}{l} \\ \\ R_3 \to R_3 - 2R_2 \\ R_4 \to R_4 - 3R_2 \end{array}$$

$$= \left[\begin{array}{ccc|c} 1 & -1 & 1 & -9 \\ 0 & 1 & -1 & 22 \\ 0 & 0 & 1 & -23 \\ 0 & 0 & 0 & -11 \end{array}\right] R_3 \leftrightarrow R_4$$

$\rho(A) = 3$, $\rho([A/B]) = 4$

Hence $\rho(A) \neq \rho([A/B])$

The given system of equation is inconsistent and has no solution

41. b) $\frac{x^2+1}{x} = 2\cos\alpha$

Ex. 2.8 4 (iii), (iv)

$x^2 - 2\cos\alpha\, x + 1 = 0$

$x = \cos\alpha \pm i\sin\alpha$

IIIly $y = \cos\beta \pm i\sin\beta$

$\frac{x}{y} = \cos(\alpha-\beta) + i\sin(\alpha-\beta)$

$\frac{y}{x} = \cos(\alpha-\beta) - i\sin(\alpha-\beta)$

$\frac{x^m}{y^n} = \cos(m\alpha - n\beta) + i\sin(m\alpha - n\beta)$

$\frac{y^n}{x^m} = \cos(m\alpha - n\beta) - i\sin(m\alpha - n\beta)$

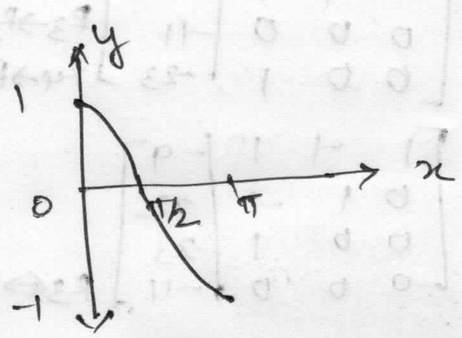
(i) $\frac{x^m}{y^n} - \frac{y^n}{x^m} = 2i\sin(m\alpha - n\beta)$

(ii) $x^m y^n = \cos(m\alpha + n\beta) + i\sin(m\alpha + n\beta)$

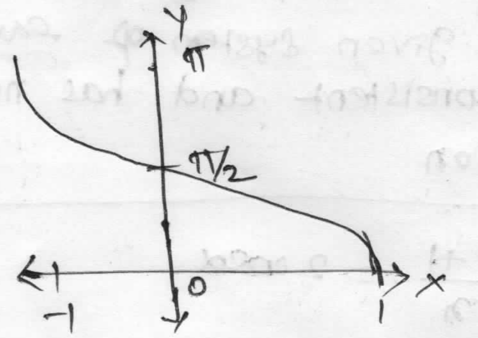
$\frac{1}{x^m y^n} = \cos(m\alpha + n\beta) - i\sin(m\alpha + n\beta)$

$x^m y^n + \frac{1}{x^m y^n} = 2\cos(m\alpha + n\beta)$

42. (a) $y = \cos x$ in $[0, \pi]$



$y = \cos^{-1} x$ in $[-1, 1]$



42. b) General equation of circle

Example 5.10

$x^2+y^2+2gx+2fy+c=0 \rightarrow (1)$

It passes through (1,1), (2,−1), and (3,2)

$2g+2f+c=-2 \longrightarrow (2)$

$4g-2f+c=-5 \longrightarrow (3)$

$6g+4f+c=-13 \longrightarrow (4)$

$(2)-(3) \Rightarrow \quad -2g+4f=3 \rightarrow (5)$

$(4)-(3) \Rightarrow \quad 2g+6f=-8 \rightarrow (6)$

$(5)+(6) \Rightarrow \quad f=-1/2$

sub $f=-1/2$ in (6)

$\Rightarrow g=-5/2$

sub $f=-1/2, g=-5/2$ in (2)

$\Rightarrow c=4$

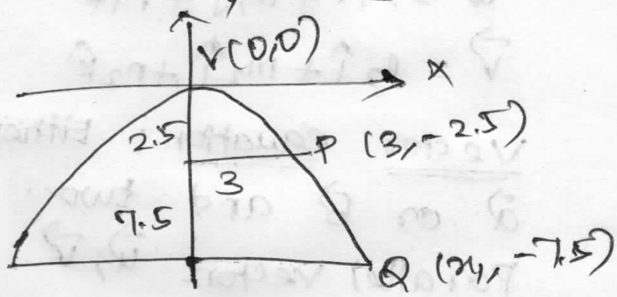
required equation of circle is

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

43. a) By given data parabola is open downward

Ex 5.5 (8)

$x^2=-4ay$



P (3, −2.5) lies on the parabola

$3^2 = -4a(-2.5)$

$9 = 10a$

$\boxed{a = \frac{9}{10}}$

Equation of parabola $x^2 = -4\left(\frac{9}{10}\right)y$

$Q(x_1, -7.5)$

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

$x_1^2 = 27$

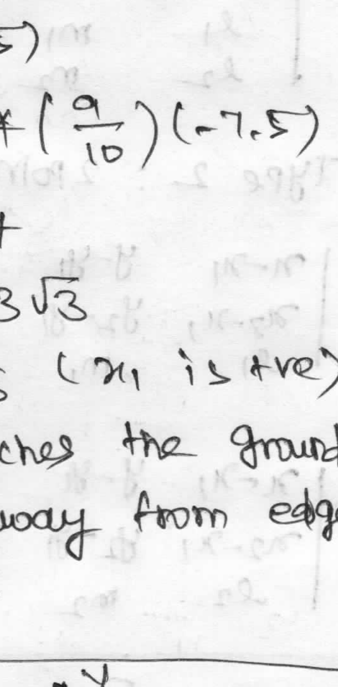
$x_1 = \pm 3\sqrt{3}$

$\therefore x_1 = 3\sqrt{3}$ (x_1 is +ve)

$\therefore$ water touches the ground $3\sqrt{3}$ mts away from edges of the pipe

43. b) $\hat{a} = \vec{OA}$

$\hat{b} = \vec{OB}$



$|\vec{OL}| = |\vec{OA}| \cos\alpha$

$= \cos\alpha$

$|\vec{LA}| = |\vec{OA}| \sin\alpha$

$= \sin\alpha$

$\vec{OL} = \cos\alpha\, \hat{i}, \quad \vec{LA} = \sin\alpha(-\hat{j})$

$\hat{a} = \vec{OA} = \vec{OL} + \vec{LA}$

$= \cos\alpha\,\hat{i} - \sin\alpha\,\hat{j} \longrightarrow (1)$

$\hat{b} = \cos\beta\,\hat{i} + \sin\beta\,\hat{j} \longrightarrow (2)$

The angle b/w $\hat{a}$ and $\hat{b}$ is

$\alpha + \beta$

$\hat{a}\cdot\hat{b} = |\hat{a}||\hat{b}|\cos(\alpha+\beta)$

$= \cos(\alpha+\beta) \longrightarrow (3)$

Example 6.3

From (1), (2)

$\hat{a}\cdot\hat{b} = (\cos\alpha\,\hat{i} - \sin\alpha\,\hat{j})\cdot(\cos\beta\,\hat{i} + \sin\beta\,\hat{j})$

$= \cos\alpha\cos\beta - \sin\alpha\sin\beta \longrightarrow (4)$

From (3), (4)

$\cos(\alpha+\beta) = \cos\alpha\cos\beta - \sin\alpha\sin\beta$

---

44. a)

$\vec{a} = \hat{j} - 5\hat{k}$

$\vec{b} = 2\hat{i} + 3\hat{j} + 6\vec{k}$

$\vec{c} = \hat{i} + \hat{j} - \hat{k}$

$\vec{b}$ is not parallel to $\vec{c}$

Example 6.43

<u>vector equation</u>

$(\vec{r} - \vec{a})\cdot(\vec{b}\times\vec{c}) = 0 \rightarrow (1)$

$$\vec{b}\times\vec{c} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 3 & 6 \\ 1 & 1 & -1 \end{vmatrix}$$

$= -9\hat{i} + 8\hat{j} - \hat{k}$

$(\vec{r} - (\hat{j} - 5\hat{k}))\cdot(-9\hat{i} + 8\hat{j} - \hat{k}) = 0$

$\vec{r}\cdot(-9\hat{i} + 8\hat{j} - \hat{k}) = 13$

<u>cartesian equation</u>

$(x\hat{i} + y\hat{j} + z\hat{k})\cdot(-9\hat{i} + 8\hat{j} - \hat{k}) = 13$

$-9x + 8y - z = 13$

$9x - 8y + z + 13 = 0$

44. b)

$$I = \int_{-\pi}^{\pi} \frac{\cos^2 x}{1 + a^x}\,dx \rightarrow (1)$$

$$\boxed{\int_a^b f(x)\,dx = \int_a^b f(a+b-x)\,dx}$$

$$I = \int_{-\pi}^{\pi} \frac{\cos^2(\pi - \pi - x)}{1 + a^{\pi-\pi-x}}\,dx$$

$$I = \int_{-\pi}^{\pi} \frac{\cos^2(-x)}{1 + a^{-x}}\,dx$$

$$I = \int_{-\pi}^{\pi} a^x\left(\frac{\cos^2 x}{a^x + 1}\right)dx \rightarrow (2)$$

Example 9.30

Adding (1), (2)

$$2I = \int_{-\pi}^{\pi} \frac{\cos^2 x}{a^x + 1}(a^x + 1)\,dx$$

$$= \int_{-\pi}^{\pi} \cos^2 x\,dx$$

$$2I = 2\int_0^{\pi} \cos^2 x\,dx$$

$$I = \int_0^{\pi} \frac{1 + \cos 2x}{2}\,dx$$

$$= \frac{1}{2}\left[x + \frac{\sin 2x}{2}\right]_0^{\pi}$$

$= \frac{1}{2}(\pi)$

$= \pi/2$

---

45. b)

$$y = \begin{cases} \cos x, & 0 \le x \le \pi/2 \\ -\cos x, & \pi/2 \le x \le \pi \end{cases}$$

Example 9.53

It lies above x axis

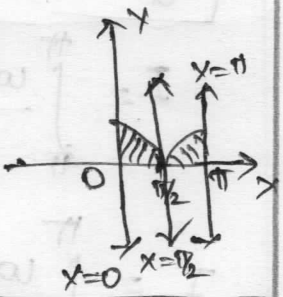
$$A = \int_0^{\pi/2} y\,dx$$

$$= \int_0^{\pi/2} \cos x\,dx + \int_{\pi/2}^{\pi} (-\cos x)\,dx$$

$$= [\sin x]_0^{\pi/2} - [\sin x]_{\pi/2}^{\pi}$$

$$= [1-0] - [0-1]$$

$$= 2$$



46. a) Area $= 196$

side $= 14$

volume $= x(14-x)^2$

$V = 196x + x^3 - 28x^2$

$V' = 196 + 3x^2 - 56x$

For maximum $V' = 0$

$x = \frac{49}{3},\ x = \frac{7}{3}$

Creative

$V'' = 6x - 56$

when $x = \frac{49}{3}$, $V'' > 0$

$x = 7/3$, $V'' < 0$

Volume is maximum when side is $7/3$

46. b) $M \frac{dv}{dt} = F - KV$

On separating the variable

Ex. 10.5 (1)

$$\frac{M}{F-KV}\,dv = dt$$

$$\int \frac{M}{F-KV}\,dv = \int dt$$

$$\frac{-M}{K} \int \frac{-K}{F-KV}\,dv = \int dt$$

$$\frac{-M}{K} \log(F-KV) = t + C \rightarrow (1)$$

When $t=0, v=0$

From (1) $\frac{-M}{K} \log F = C \rightarrow (2)$

Sub (2) in (1)

$$\frac{-M}{K} \log(F-KV) = t - \frac{M}{K} \log F$$

$$\frac{M}{K} \log F - \frac{M}{K} \log(F-KV) = t$$

$$\frac{M}{K} \log\left(\frac{F}{F-KV}\right) = t$$

$$\log\left(\frac{F}{F-KV}\right) = \frac{Kt}{M}$$

$$\frac{F}{F-KV} = e^{Kt/m}$$

$$F = (F-KV)\, e^{Kt/m}$$

$$F - KV = Fe^{-Kt/m}$$

$$KV = F\left(1 - e^{-Kt/m}\right)$$

$$v = F/K \left(1 - e^{\frac{-Kt}{m}}\right)$$

47. a) $T \Rightarrow$ Temperature of the body at any time t.

$t = 0$ at 8 PM

Example 10.29

By Newtons law of cooling

$$\frac{dT}{dt} = k(T-50)$$

$$\frac{dT}{T-50} = dt$$

Sing $\log|50-T| = kt + \log C$

$50 - T = C e^{kt}$

when $t = 0$, $T = 70 \Rightarrow C = -20$

when $t = 2$, $T = 60 \Rightarrow -10 = -20 e^{k2}$

$$k = \frac{1}{2} \log(1/2)$$

$$50 - T = -20 e^{\frac{1}{2}\log(1/2)}$$

$$T = 50 + 20\left(\frac{1}{2}\right)^{t/2}$$

$$T(t) = 98.6$$

$$t = 2\left(\frac{\log\left(\frac{48.6}{20}\right)}{\log(1/2)}\right)$$

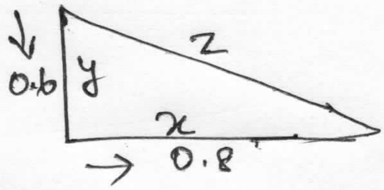
$$\simeq -2.56$$

It appears that the person was murdered at about 5.30 pm

45. a) x, y position of the car and jeep

Ex. 7.4 (10)

$$\frac{dy}{dt} = -60$$



$$\frac{dz}{dt} = 20$$

$\frac{dx}{dt} = ?$ when $x = 0.8$, $y = 0.6$

$$z^2 = x^2 + y^2$$

$$x = 0.8,\ y = 0.6,\ z = 1$$

$\frac{dx}{dt} = ?$ when $z = 1$

$$2z \frac{dz}{dt} = 2x \frac{dx}{dt} + 2y \frac{dy}{dt}$$

$$(1)(20) = (0.8)\frac{dx}{dt} + (0.6)(-60)$$

$$\frac{dx}{dt} = 70 \text{ km/hr}$$

47. b) $X \rightarrow$ number of Heads

$X \rightarrow 0, 1, 2, 3$

Ex. 11.2 - (1)

x	0	1	2	3
$f(x)$	$1/8$	$3/8$	$3/8$	$1/8$

$$E(X) = \sum x_i f(x_i) = 3/2$$

$$E(X^2) = \sum x_i^2 f(x_i) = 3$$

$$Var(X) = E(X^2) - [E(X)]^2$$

$$= 3 - \frac{9}{4} = \frac{3}{4}$$

Binomial distribution

$n = 3$, $p = 1/2$, $q = 1/2$

mean $= np = 3(1/2) = 3/2$

Variance $= npq = 3(1/2)(1/2) = 3/4$

Prepared by

Dr. K. DINESH M.Sc, M.Phil, PGDCA, PhD

Asst. Professor || WTS Teachers Team

PG & Research Dept of Mathematics

Urumu Dhanalakshmi College,

Trichy