

QUESTION PAPER CODE 65/2/G

EXPECTED ANSWERS/VALUE POINTS

SECTION - A

Marks

1. d.r's of  $\vec{AB}$ :  $1, -5 - a, b - 3$ ; d.r's of  $\vec{BC}$  are  $-4, 16, 9 - b$  or d.r's of  $\vec{AC}$ :  $-3, 11 - a, 6$   $\frac{1}{2}$  m  
 getting  $a = -1, b = 1, a + b = 0$   $\frac{1}{2}$  m

2.  $|\vec{a}| |\vec{b}| \sin \theta = 16 \Rightarrow \sin \theta = \frac{16}{20} = \frac{4}{5} \Rightarrow \cos \theta = \pm \frac{3}{5}$   $\frac{1}{2}$  m  
 $\vec{a} \cdot \vec{b} = |\vec{a}| |\vec{b}| \cos \theta = \pm 12$   $\frac{1}{2}$  m

3.  $d = \frac{|9 - 6|}{\sqrt{2^2 + (-1)^2 + (-2)^2}}$   $\frac{1}{2}$  m  
 $= 1$   $\frac{1}{2}$  m

4.  $3 \begin{bmatrix} 2 & 4 \\ 3 & 2 \end{bmatrix} - \begin{bmatrix} -2 & 5 \\ 3 & 4 \end{bmatrix}$   $\frac{1}{2}$  m  
 $= \begin{bmatrix} 8 & 7 \\ 6 & 2 \end{bmatrix}$   $\frac{1}{2}$  m

5.  $y = e^{-x} + ax + b \Rightarrow y' = -e^{-x} + a$   $\frac{1}{2}$  m  
 $y'' = e^{-x}$  or  $\frac{d^2y}{dx^2} = e^{-x}$   $\frac{1}{2}$  m

6. Order = 2, degree = 2 (any one correct)  $\frac{1}{2}$  m  
 Sum = 2 + 2 = 4  $\frac{1}{2}$  m

## SECTION - B

7. Given  $\frac{x}{x-y} = \log a - \log(x-y)$  ½ m

Differentiating both sides and getting [∵  $x \neq y$ ]

$$x - 2y + y \frac{dy}{dx} = 0 \quad \text{2½ m}$$

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

$$\Rightarrow \frac{dy}{dx} = 2 - \frac{x}{y} \quad \text{1 m}$$

8.  $I = \int \frac{dx}{x^3(x^5+1)^{3/5}}$

$$= \int \frac{dx}{x^3 \cdot x^3 \left(1 + \frac{1}{x^5}\right)^{3/5}} \quad \text{1½ m}$$

Put  $1 + \frac{1}{x^5} = t$

$$\Rightarrow \frac{dx}{x^6} = -\frac{dt}{5} \quad \text{1 m}$$

$$\therefore I = -\frac{1}{5} \int t^{-3/5} dt = -\frac{1}{2} t^{2/5} + C \quad \text{1 m}$$

$$= -\frac{1}{2} \left(1 + \frac{1}{x^5}\right)^{2/5} + C \quad \text{½ m}$$

$$\begin{aligned}
9. \quad I &= \int_2^4 |x-2| dx + \int_2^4 |x-3| dx + \int_2^4 |x-4| dx && \frac{1}{2} \text{ m} \\
&= \int_2^4 (x-2) dx + \int_2^3 -(x-3) dx + \int_3^4 (x-3) dx + \int_2^4 -(x-4) dx && 2 \text{ m} \\
&= \left[ \frac{x^2}{2} - 2x \right]_2^4 - \left[ \frac{x^2}{2} - 3x \right]_2^3 + \left[ \frac{x^2}{2} - 3x \right]_3^4 - \left[ \frac{x^2}{2} - 4x \right]_2^4 && 1 \text{ m} \\
&= 5 && \frac{1}{2} \text{ m}
\end{aligned}$$

OR

$$\begin{aligned}
I &= \int_0^{\pi/4} \frac{\sec x}{1+2\sin^2 x} dx = \int_0^{\pi/4} \frac{\cos x}{\cos^2 x (1+2\sin^2 x)} dx \\
&= \int_0^{\pi/4} \frac{\cos x}{(1-\sin x)(1+\sin x)(1+2\sin^2 x)} dx && 1 \text{ m}
\end{aligned}$$

Put  $\sin x = t \Rightarrow \cos x dx = dt$ , when  $x=0, t=0$

$$x = \frac{\pi}{4}, t = \frac{1}{\sqrt{2}} \quad \frac{1}{2} \text{ m}$$

$$\therefore I = \int_0^{1/\sqrt{2}} \frac{dt}{(1-t)(1+t)(1+2t^2)}$$

$$\therefore I = \int_0^{1/\sqrt{2}} \frac{dt}{6(1-t)} + \int_0^{1/\sqrt{2}} \frac{dt}{6(1+t)} + \int_0^{1/\sqrt{2}} \frac{2 dt}{3(1+2t^2)} \quad 1 \text{ m}$$

$$= \left[ \frac{1}{6} \log \left| \frac{1+t}{1-t} \right| + \frac{\sqrt{2}}{3} \tan^{-1}(\sqrt{2} t) \right]_0^{1/\sqrt{2}} \quad 1 \text{ m}$$

$$= \frac{1}{6} \log \left| \frac{1 + \frac{1}{\sqrt{2}}}{1 - \frac{1}{\sqrt{2}}} \right| + \frac{\sqrt{2}}{3} \tan^{-1}(1)$$

$$= \frac{1}{3} \log |\sqrt{2} + 1| + \frac{\pi}{6\sqrt{2}} \quad \text{or} \quad \frac{1}{6} \log (3 + 2\sqrt{2}) + \frac{\pi}{6\sqrt{2}} \quad \frac{1}{2} \text{ m}$$

$$10. \quad \text{LHS} = \sin \left[ \cot^{-1} \left( \frac{2x}{1-x^2} \right) + 2 \tan^{-1} x \right] \quad 1 \text{ m}$$

$$= \sin \left[ \frac{\pi}{2} - \tan^{-1} \left( \frac{2x}{1-x^2} \right) + 2 \tan^{-1} x \right] \quad 1 \text{ m}$$

$$= \sin \left[ \frac{\pi}{2} - 2 \tan^{-1} x + 2 \tan^{-1} x \right] \quad 1 \text{ m}$$

$$= \sin \frac{\pi}{2} = 1 = \text{R.H.S} \quad 1 \text{ m}$$

OR

$$\tan^{-1} \left( \frac{\frac{x-5}{x-6} + \frac{x+5}{x+6}}{1 - \frac{x-5}{x-6} \cdot \frac{x+5}{x+6}} \right) = \frac{\pi}{4} \quad 2 \text{ m}$$

$$\Rightarrow \frac{(x-5)(x+6) + (x+5)(x-6)}{x^2 - 36 - x^2 + 25} = \tan \frac{\pi}{4} \quad 1 \text{ m}$$

$$\Rightarrow 2x^2 = 49 \quad \frac{1}{2} \text{ m}$$

$$\Rightarrow x = \pm \frac{7}{\sqrt{2}} \quad \frac{1}{2} \text{ m}$$

$$11. \quad \text{L.H.S.} = \begin{vmatrix} 1+a^2-b^2 & 2ab & -2b \\ 2ab & 1-a^2+b^2 & 2a \\ 2b & -2a & 1-a^2-b^2 \end{vmatrix}$$

$$R_1 \rightarrow R_1 + b \cdot R_3, \quad R_2 \rightarrow R_2 - a R_3$$

$$= \begin{vmatrix} 1+a^2+b^2 & 0 & -b(1+a^2+b^2) \\ 0 & 1+a^2+b^2 & a(1+a^2+b^2) \\ 2b & -2a & 1-a^2-b^2 \end{vmatrix} \quad 1+1 \text{ m}$$

$$= (1+a^2+b^2)^2 \begin{vmatrix} 1 & 0 & -b \\ 0 & 1 & a \\ 2b & -2a & 1-a^2-b^2 \end{vmatrix} \quad 1 \text{ m}$$

Expanding and getting

$$\Delta = (1+a^2+b^2)^3 = \text{R.H.S.} \quad 1 \text{ m}$$

$$12. \quad A^2 = \begin{pmatrix} 6 & -5 & 5 \\ -5 & 6 & -5 \\ 5 & -5 & 6 \end{pmatrix} \quad 1\frac{1}{2} \text{ m}$$

$$A^2 - 5A + 4I = \begin{pmatrix} 6 & -5 & 5 \\ -5 & 6 & -5 \\ 5 & -5 & 6 \end{pmatrix} - \begin{pmatrix} 10 & -5 & 5 \\ -5 & 10 & -5 \\ 5 & -5 & 10 \end{pmatrix} + \begin{pmatrix} 4 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 4 \end{pmatrix}$$

$$= O \quad 1 \text{ m}$$

Pre multiplying by  $A^{-1}$  and getting  $A^{-1} = \frac{1}{4}(5I - A)$   $\frac{1}{2} \text{ m}$

$$\text{and } A^{-1} = \frac{1}{4} \begin{pmatrix} 3 & 1 & -1 \\ 1 & 3 & 1 \\ -1 & 1 & 3 \end{pmatrix} \quad 1 \text{ m}$$

OR

$$A = IA \quad 1 \text{ m}$$

$$\Rightarrow \begin{pmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 0 \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} A$$

$$R_1 \leftrightarrow R_2$$

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \\ 3 & 1 & 0 \end{pmatrix} = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix} A$$

$$R_3 \rightarrow R_3 - 3R_1$$

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \\ 0 & -5 & -9 \end{pmatrix} = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & -3 & 1 \end{pmatrix} A$$

$$R_1 \rightarrow R_1 - 2R_2, \quad R_3 \rightarrow R_3 + 5R_2$$

$$\begin{pmatrix} 1 & 0 & -1 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{pmatrix} = \begin{pmatrix} -2 & 1 & 0 \\ 1 & 0 & 0 \\ 5 & -3 & 1 \end{pmatrix} A$$

$$R_1 \rightarrow R_1 + R_3, \quad R_2 \rightarrow R_2 - 2R_3$$

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} = \begin{pmatrix} 3 & -2 & 1 \\ -9 & 6 & -2 \\ 5 & -3 & 1 \end{pmatrix} A \text{ [operating Row wise to reach at this step]} \quad 2\frac{1}{2} \text{ m}$$

$$A^{-1} = \begin{pmatrix} 3 & -2 & 1 \\ -9 & 6 & -2 \\ 5 & -3 & 1 \end{pmatrix} \quad \frac{1}{2} \text{ m}$$

13. A Candidate who has made an attempt to solve the question

to be given 4 marks

4 m

14.  $y = -x^3 \log x$

$\frac{1}{2}$  m

$$\frac{dy}{dx} = -x^2(1 + 3 \log x)$$

1 m

$$\frac{d^2y}{dx^2} = - (5x + 6x \log x) \quad 1 \text{ m}$$

$$\text{L.H.S.} = x [-(5x + 6x \log x)] + 2x^2 (1 + 3 \log x) + 3x^2 \quad 1 \text{ m}$$

$$= 0 \quad \frac{1}{2} \text{ m}$$

$$= \text{R.H.S.}$$

OR

$$f(x) = (x - 4)(x - 6)(x - 8)$$

$$= x^3 - 18x^2 + 104x - 192$$

Being a polynomial function  $f(x)$  is continuous

in  $[4, 10]$  and differentiable in  $(4, 10)$  with

$$f'(x) = 3x^2 - 36x + 104 \quad 1+1 \text{ m}$$

$$\exists c \in (4, 10) \text{ such that } f'(c) = \frac{f(b) - f(a)}{b - a}$$

$$\Rightarrow 3c^2 - 36c + 104 = 8 \quad 1\frac{1}{2} \text{ m}$$

$$\Rightarrow c = 4, 8 \quad ; c = 4 \notin (4, 10)$$

$$\therefore c = 8 : \text{ verifies the theorem} \quad \frac{1}{2} \text{ m}$$

15. Equation of line joining  $(4, 3, 2)$  and  $(1, -1, 0)$  is

$$\frac{x-4}{-3} = \frac{y-3}{-4} = \frac{z-2}{-2} \quad \frac{1}{2} \text{ m}$$

Equation of line joining  $(1, 2, -1)$  and  $(2, 1, 1)$  is

$$\frac{x-1}{1} = \frac{y-2}{-1} = \frac{z+1}{2} \quad \frac{1}{2} \text{ m}$$

Let equation of the required line be

$$\frac{x-1}{a} = \frac{y+1}{b} = \frac{z-1}{c} = \lambda \dots\dots\dots (i) \quad \frac{1}{2} \text{ m}$$

According to the question  $3a + 4b + 2c = 0$

$$a - b + 2c = 0 \quad 1 \text{ m}$$

Solving,  $\frac{a}{10} = \frac{b}{-4} = \frac{c}{-7} = \mu$

$$\Rightarrow a = 10\mu, b = -4\mu, c = -7\mu \quad \frac{1}{2} \text{ m.}$$

(i)  $\Rightarrow$  Equation of the line is

$$\frac{x-1}{10} = \frac{y+1}{-4} = \frac{z-1}{-7} \quad [\text{cartesian form}] \quad \frac{1}{2} \text{ m}$$

Vector form,  $\vec{r} = (\hat{i} - \hat{j} + \hat{k}) + \lambda(10\hat{i} - 4\hat{j} - 7\hat{k}) \quad \frac{1}{2} \text{ m}$

16. 

H	R	HW	1 m
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$$\begin{matrix} \text{A} \\ \text{B} \\ \text{C} \end{matrix} \begin{bmatrix} 3 & 4 & 6 \\ 4 & 5 & 3 \\ 6 & 2 & 4 \end{bmatrix} \begin{bmatrix} 2500 \\ 3100 \\ 5100 \end{bmatrix}$$

$$= \begin{bmatrix} 50500 \\ 40800 \\ 41600 \end{bmatrix} \quad 1 \text{ m}$$

Hence money awarded by A = Rs. 50500

money awarded by B = Rs. 40800 1 m

money awarded by C = Rs. 41600

Respect for elders or Any relevant value 1 m



$$\begin{aligned}
 17. \quad I &= \int_{\pi/4}^{\pi/2} e^{2x} \left( \frac{1 - \sin 2x}{1 - \cos 2x} \right) dx \\
 &= \int_{\pi/4}^{\pi/2} e^{2x} \left( \frac{1 - 2 \sin x \cos x}{2 \sin^2 x} \right) dx \\
 &= \int_{\pi/4}^{\pi/2} e^{2x} \left( \frac{1}{2} \operatorname{cosec}^2 x - \cot x \right) dx \qquad 1\frac{1}{2} \text{ m}
 \end{aligned}$$

$$\text{Put } 2x = t \Rightarrow dx = \frac{dt}{2}$$

$$\text{when } x = \frac{\pi}{4}, t = \frac{\pi}{2}; \quad x = \frac{\pi}{2}, t = \pi \qquad 1 \text{ m}$$

$$\begin{aligned}
 \therefore I &= \frac{1}{2} \int_{\pi/2}^{\pi} e^t \left( \frac{1}{2} \operatorname{cosec}^2 \frac{t}{2} - \cot \frac{t}{2} \right) dt \\
 &= -\frac{1}{2} \left[ \cot \frac{t}{2} \cdot e^t \right]_{\pi/2}^{\pi} \qquad 1 \text{ m} \\
 &= \frac{e^{\pi/2}}{2} \qquad \frac{1}{2} \text{ m}
 \end{aligned}$$

$$\begin{aligned}
 18. \quad \text{Let } \vec{OA} &= 4\hat{i} + 8\hat{j} + 12\hat{k}, \quad \vec{OB} = 2\hat{i} + 4\hat{j} + 6\hat{k} \\
 \vec{OC} &= 3\hat{i} + 5\hat{j} + 4\hat{k}, \quad \vec{OD} = 5\hat{i} + 8\hat{j} + 5\hat{k} \\
 \vec{AB} &= -2\hat{i} - 4\hat{j} - 6\hat{k}, \quad \vec{AC} = -\hat{i} - 3\hat{j} - 8\hat{k}, \quad \vec{AD} = \hat{i} - 7\hat{k} \qquad 1\frac{1}{2} \text{ m}
 \end{aligned}$$

$$\text{Now, } \left[ \vec{AB} \quad \vec{AC} \quad \vec{AD} \right] = \begin{vmatrix} -2 & -4 & -6 \\ -1 & -3 & -8 \\ 1 & 0 & -7 \end{vmatrix} = 0 \qquad 2 \text{ m}$$

$\therefore$  A, B, C, D are coplanar 1/2 m

19. Let  $E_1$  : Event that transferred ball is black

$E_2$  : Event that transferred ball is Red

$E_3$  : Event that balls drawn are black

$$P(E_1) = \frac{5}{9}, \quad P(E_2) = \frac{4}{9} \quad 1 \text{ m}$$

$$P(A/E_1) = \frac{{}^5C_2}{{}^8C_2} = \frac{5}{14}, \quad P(A/E_2) = \frac{{}^4C_2}{{}^8C_2} = \frac{3}{14} \quad 1 \text{ m}$$

$$P(E_1/A) = \frac{P(E_1) \cdot P(A/E_1)}{P(E_1) P(A/E_1) + P(E_2) P(A/E_2)} \quad \frac{1}{2} \text{ m}$$

$$= \frac{\frac{5}{9} \times \frac{5}{14}}{\frac{5}{9} \times \frac{5}{14} + \frac{4}{9} \times \frac{3}{14}} \quad 1 \text{ m}$$

$$= \frac{25}{37} \quad \frac{1}{2} \text{ m}$$

### SECTION - C

20.  $(y - \sin x) dx + (\tan x) dy = 0 \Rightarrow \frac{dy}{dx} + \cot x y = \cos x \quad 1 \text{ m}$

Linear diff. equ. with  $P = \cot x$ ,  $Q = \cos x$

$$\text{I.F.} = \sin x \quad 1 \text{ m}$$

Solution is  $y \cdot \sin x = \int \cos x \cdot \sin x dx + c$

$$= -\frac{1}{4} \cos 2x + c \quad 2 \text{ m}$$

when  $x = 0, y = 0 \Rightarrow c = \frac{1}{4} \quad 1 \text{ m}$

Particular solution is

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

$$\Rightarrow y = \frac{1}{2} \sin x \quad 1 \text{ m}$$

21. d.r's of first line :  $k - 5, 1, 2k + 1$  1 m

d.r's of 2nd line :  $-1, k, 5$  1 m

$\therefore$  lines are  $\perp \therefore -1(k - 5) + k(1) + 5(2k + 1) = 0$

$$\Rightarrow k = -1 \quad \text{1 m}$$

Eqns of lines become  $\frac{x+3}{-6} = \frac{y-1}{-1} = \frac{z-5}{-1}$  and  $\frac{x+2}{-1} = \frac{y-2}{-1} = \frac{z}{5}$  1 m

Eqn of plane containing these two lines is

$$\begin{vmatrix} x+2 & y-2 & z \\ -6 & 1 & -1 \\ -1 & -1 & 5 \end{vmatrix} = 0 \quad \text{1 m}$$

$$\Rightarrow 4x + 31y + 7z = 54 \quad \text{1 m}$$

22.  $(a, b) * (c, d) = (a + c, b + d) \quad \forall a, b, c, d \in \mathbb{R}$

Since  $a + c \in \mathbb{R}$  and  $b + d \in \mathbb{R} \Rightarrow (a + c, b + d) \in \mathbb{R} \times \mathbb{R}$  1½ m

i.e. '\*' is binary operation

For commutative

$$\begin{aligned} \text{consider } (c, d) * (a, b) &= (c + a, d + b) \\ &= (a + c, b + d) \\ &= (a, b) * (c, d) \quad \text{1½ m} \\ \Rightarrow \text{'*'} &\text{ is commutative} \end{aligned}$$

For Associative

Let  $(a, b), (c, d), (e, f) \in \mathbb{R} \times \mathbb{R} = A$

$$\begin{aligned} [(a, b) * (c, d)] * (e, f) &= (a + c, b + d) * (e, f) \\ &= (a + c + e, b + d + f) \dots\dots\dots(i) \end{aligned}$$

$$\begin{aligned} \text{again } (a, b) * [(c, d) * (e, f)] &= (a, b) * (c + e, d + f) \\ &= (a + c + e, b + d + f) \dots\dots\dots(ii) \quad \text{1½ m} \end{aligned}$$

(i) & (ii)  $\Rightarrow$  '\*' is associative

For identity element

Let  $(e_1, e_2) \in \mathbb{R} \times \mathbb{R}$  be the identity element (if exists)

then  $(a, b) * (e_1, e_2) = (a, b) = (e_1, e_2) * (a, b)$

$$\Rightarrow (e_1, e_2) = (0, 0) \in \mathbb{R} \times \mathbb{R} \quad 1\frac{1}{2} \text{ m}$$

OR

$$f(x) = x^2 - x; \quad x \in \{-1, 0, 1, 2\}$$

$$f(-1) = 2, \quad f(0) = 0, \quad f(1) = 0, \quad f(2) = 2$$

$$\therefore f = \{(-1, 2), (0, 0), (1, 0), (2, 2)\} \quad 2 \text{ m}$$

$$g(x) = 2 \left| x - \frac{1}{2} \right| - 1 \quad \forall x \in \{-1, 0, 1, 2\}$$

$$g(-1) = 2, \quad g(0) = 0, \quad g(1) = 0, \quad g(2) = 2$$

$$\therefore g = \{(-1, 2), (0, 0), (1, 0), (2, 2)\} \quad 2 \text{ m}$$

$$\begin{aligned} (g \circ f)(x) &= g(f(-1)), g(f(0)), g(f(1)), g(f(2)) \quad \forall x \in A \\ &= 2, 0, 0, 2 \end{aligned}$$

$$\therefore g \circ f = \{(-1, 2), (0, 0), (1, 0), (2, 2)\} \quad 2 \text{ m}$$

Hence  $f = g = g \circ f$

23. Given curve cuts the x-axis when  $y = 0$  1/2 m

when  $y = 0$ ,  $x = 7$ , hence point is  $(7, 0)$  1/2 m

$$\frac{dy}{dx} = \frac{1 - y(2x - 5)}{x^2 - 5x + 6} \quad 2\frac{1}{2} \text{ m}$$

$$\left. \frac{dy}{dx} \right|_{(7,0)} = \frac{1}{20} \quad 1/2 \text{ m}$$

Equation of the tangent is  $y - 0 = \frac{1}{20}(x - 7)$  1 m

$$\Rightarrow x - 20y = 7$$

Equation of the normal is  $y - 0 = -20(x - 7)$  1 m

$$\Rightarrow 20x + y = -7$$

OR

$$f(x) = \cos^2 x + \sin x, \quad x \in [0, \pi]$$

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

For extremum,  $f'(x) = 0 \Rightarrow x = \frac{\pi}{2}$  or  $x = \frac{\pi}{6}, \frac{5\pi}{6}$  1½ m

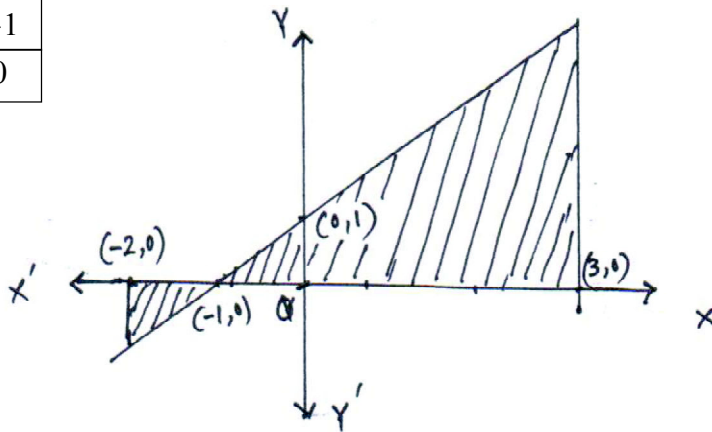
Now  $f(0) = 1, f\left(\frac{\pi}{6}\right) = \frac{5}{4}, f\left(\frac{\pi}{2}\right) = 1, f\left(\frac{5\pi}{6}\right) = \frac{5}{4}, f(\pi) = 1$  1½ m

Absolute max. is  $\frac{5}{4}$  at  $x = \frac{\pi}{6}$  and  $\frac{5\pi}{6}$  1 m

Absolute min. is 1 at  $x = 0, \frac{\pi}{6}$  and  $\pi$  1 m

24.  $y = x + 1, \quad x = -2, \quad x = 3$

x	0	-1
y	1	0



For correct figure 1 m

$$\text{Reqd area} = \left| \int_{-2}^{-1} (x+1) dx \right| + \int_{-1}^3 (x+1) dx$$
 2 m

$$= \left| \left( \frac{x^2}{2} + x \right)_{-2}^{-1} \right| + \left( \frac{x^2}{2} + x \right)_{-1}^3$$
 2 m

$$= \frac{17}{2} \text{ sq. units}$$
 1 m

25. Let  $x$  denote no. of heads

here  $p = \frac{1}{2}$ ,  $q = \frac{1}{2}$  1 m

$$P(x=r) = {}^n C_r \left(\frac{1}{2}\right)^r \left(\frac{1}{2}\right)^{n-r}$$

$$= {}^n C_r \left(\frac{1}{2}\right)^n$$
1 m

Now  $P(x=1) = {}^n C_1 \left(\frac{1}{2}\right)^n$

$$P(x=2) = {}^n C_2 \left(\frac{1}{2}\right)^n$$
1½ m

$$P(x=3) = {}^n C_3 \left(\frac{1}{2}\right)^n$$

According to the question

$$2 \cdot {}^n C_2 \left(\frac{1}{2}\right)^n = ({}^n C_1 + {}^n C_3) \left(\frac{1}{2}\right)^n$$
2 m

$$\Rightarrow n = 2 \text{ or } 7$$
½ m

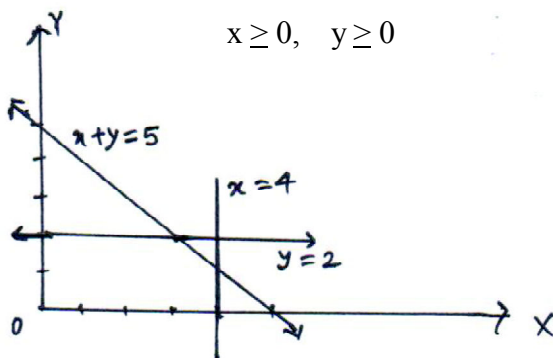
$n$  can not be 2 Hence  $n = 7$

26. Let  $x$  kg of  $B_1$  and  $y$  kg of  $B_2$  is taken

then to minimize  $Z = 5x + 8y$  1 m

subject to the following constraints 3 m

$$x + y = 5, \quad x \leq 4, \quad y \geq 2$$



Graph 2 m