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(18) $P(A) = \frac{1}{2}$ $P(A/B) = \frac{1}{4}$

$P(B) = \frac{1}{3}$ $P(A' \cap B') = ?$

Sol $P(A' \cap B') = P(\overline{A \cup B}) = 1 - P(A \cup B) = 1 - \frac{3}{4} = \frac{1}{4}$

$P(A/B) = \frac{P(A \cap B)}{P(B)} \rightarrow \frac{1}{4} = \frac{P(A \cap B)}{\frac{1}{3}} \rightarrow P(A \cap B) = \frac{1}{12}$

Now $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$= \frac{1}{2} + \frac{1}{3} - \frac{1}{12}$

$\frac{6 + 4 - 1}{12} = \frac{9}{12} = \frac{3}{4}$

(19) a

(20) c

(21) Sol Relation R on $N \times N$ is given by

$(a, b)\, R(c, d) \Leftrightarrow ad(b + c) = bc(a + d)$.

For reflexive: For $(a, b) \in N \times N$

$(a, b)\, R(a, b) \Rightarrow ab(b + a) = ba(a + b)$, true in N.

Hence, reflexive

For symmetric: For $(a, b), (c, d) \in N \times N$

$(a, b)\, R(c, d) \Rightarrow ad(b + c) = bc(a + d)$

$\Rightarrow cb(d + a) = da(c + b)$ ($\because \times$ and $+$ is commutative in N)

$\Rightarrow (c, d)\, R(a, b)\ \forall\ (a, b), (c, d) \in N \times N$.

Hence, symmetric

For transitive: For $(a, b), (c, d), (e, f) \in N \times N$

Let $(a, b)\, R(c, d)$ and $(c, d)\, R(e, f)$

$\Rightarrow \quad ad(b + c) = bc(a + d)$

$\Rightarrow \quad \frac{1}{c} + \frac{1}{b} = \frac{1}{d} + \frac{1}{a}$

and $\quad cf(d + e) = de(c + f)$

$\Rightarrow \quad \frac{1}{e} + \frac{1}{d} = \frac{1}{f} + \frac{1}{c}$

$\Rightarrow \quad \frac{1}{c} + \frac{1}{b} + \frac{1}{e} + \frac{1}{d} = \frac{1}{d} + \frac{1}{a} + \frac{1}{f} + \frac{1}{c}$

$\Rightarrow \quad \frac{1}{b} + \frac{1}{e} = \frac{1}{a} + \frac{1}{f}$

$\Rightarrow \quad af(e + b) = be(f + a) \Rightarrow af(b + e) = be(a + f)$

$\Rightarrow (a, b)\, R(e, f)$

As $(a, b)\, R(c, d)$, $(c, d)\, R(e, f)$

$\Rightarrow (a, b)\, R(e, f)$. Hence, transitive.

As relation R is reflexive, symmetric and transitive.

Hence, R is an equivalence relation.

22 In Set-1

23 Set-1

24 Put $x^2 = y$ and use P.F $= 1 + \frac{7y + 19}{y^2 - 2y - 15}$

NCERT Q.

$x + \frac{1}{4\sqrt{3}} \tan^{-1} \frac{x}{\sqrt{3}} + \frac{27}{4} \left[\frac{1}{2\sqrt{5}} \log \left| \frac{x - \sqrt{5}}{x + \sqrt{5}} \right| + c \right]$

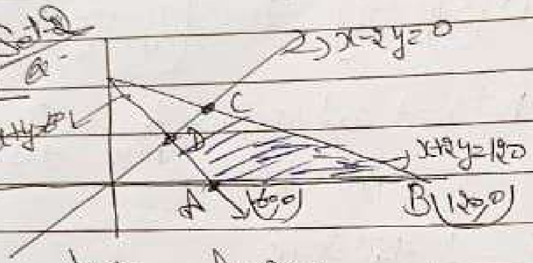
Sol 32 $\frac{dx}{dt} = a(1-\cos t)$, $\frac{dy}{dt} = a\sin t$

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

$\frac{d^2y}{dx^2} = -\operatorname{cosec}^2\frac{t}{2}\cdot\frac{1}{2}\frac{dt}{dx}$ put value we get $-\frac{1}{a}$

S 33 $|A| = 4$, adj A $\begin{bmatrix} 7 & 1 & -3 \\ -19 & -1 & 11 \\ -11 & -1 & 7 \end{bmatrix}$ $x = 2$, $y = 1$, $z = 3$

Sol 34 Sol-8 Q-



Minimum = 300
Max at = 600 ← Inf. pt on line BC

Sol 35 I.F. $= e^{\int\cot x} = e^{\log\sin x} = \sin x$ $P = \cot x$, $Q = 2\cos x$

$y\sin x = \int \sin x \cdot 2\cos x\,dx + \int \sin x\,dx$

$y\sin x = -\frac{\cos 2x}{2} + c$, put $y=0$, $x = \frac{\pi}{2}$ $c = -\frac{1}{2}$

$\therefore y\sin x = -\frac{1}{2}\cos 2x - \frac{1}{2}$

Sol 36 (i) $\frac{3000}{9000} = \frac{1}{3}$ (ii) 0.02 (iii) $\frac{8}{450}$ a $\frac{2}{5}$

OR $\frac{2}{9}\times 0.01 + \frac{4}{9}\,0.04 + \frac{3}{9}\times 0.2$

$= \frac{24}{900} = \frac{2}{75}$

Sol 37 (i) $100^2 = a^2 + x^2 \rightarrow a = \sqrt{10000 - x^2}$

(ii) $P = (400 + 2x)$ m.

(iii) $A = \frac{1}{2}(100 + 100 + 2x)a = (100+x)\sqrt{10000-x^2}$

OR $\frac{dA}{dx} = \frac{(100+x)(-2x)}{2\sqrt{10000-x^2}} + \sqrt{10000-x^2} = 0$

$x^2 + 50x - 5000 = 0 \rightarrow x = 50, -100$ $x = 50$

Sol 38 (i) $\vec{OB} - \vec{OA} = AB = -2\hat{i} + \hat{j} + \hat{k}$ (ii) $\sqrt{6}$

(iii) $\frac{-2i + j + k}{\sqrt{6}}$

(27) $f'(x) = 4\sin^3 x\cos x + 4\cos^3 x(-\sin x) = -4\sin x\cos x(\cos^2 x - \sin^2 x)$

$= -2\sin 2x\cos 2x = -\sin 4x = 0 \rightarrow x = \frac{\pi}{4}$

$\overset{-}{\underset{0}{|}} \quad \underset{\frac{\pi}{4}}{|} \quad \overset{+}{} \quad \underset{\frac{\pi}{2}}{|}$ Inc $\left(\frac{\pi}{4}, \frac{\pi}{2}\right]$

Dec $\left[0, \frac{\pi}{4}\right)$

OR $f'(x) = \cos x - \sin x = 0 \rightarrow \tan x = 1 \rightarrow x = \frac{\pi}{4}$

$\underset{0}{} \overset{+}{} \underset{\frac{\pi}{4}}{|} \overset{-}{} \underset{\frac{5\pi}{4}}{|} \overset{+}{} \underset{2\pi}{}$

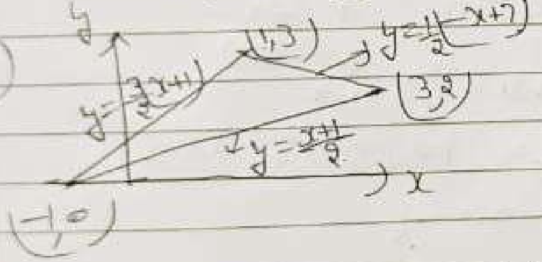
Increasing $\left[0, \frac{\pi}{4}\right) \cup \left(\frac{5\pi}{4}, 2\pi\right]$ Dec $\left(\frac{\pi}{4}, \frac{5\pi}{4}\right)$

28 $\int \frac{x^2+1}{(x^2+4)(x^2+25)}$ Put $x^2 = t$ and use P.F $\frac{A}{t+4} + \frac{B}{t+5}$

$A = -\frac{1}{7}, \; B = \frac{8}{7}$

$\frac{8}{35}\tan^{-1}\frac{x}{5} - \frac{1}{14}\tan^{-1}\frac{x}{2} + C$

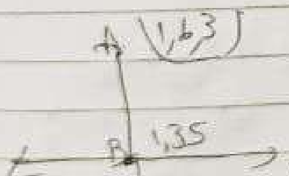
(29)



Solve we get

4 Sq. units

(30)



D.R of AB $<\lambda - 1, 2\lambda - 5, 3\lambda - 1>$

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

$\lambda = 1$

$\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3} = \lambda, \rightarrow x = (\lambda, 1+2\lambda, 2+3\lambda)$

i.e. (1, 0, 7)

(31) $E_1 \rightarrow$ by yoga $= \frac{1}{2}$ $A \rightarrow$ Suffer heart attack

$E_2 \rightarrow$ " drug $= \frac{1}{2}$

$P(A/E_1) = \frac{70}{100}$

$P(A/E_2) = \frac{75}{100}$

$P(E_1/A) = \frac{\frac{1}{2}\cdot\frac{7}{10}}{\frac{1}{2}\cdot\frac{7}{10} + \frac{1}{2}\cdot\frac{75}{100}} = \frac{14}{29}$

OR $= \frac{4}{9}$

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12th Maths
Preboard-Set-1 (24-11-25)

Sol1 $^8P_4 = 8\times7\times6\times5 = 1680$
[For one-one $n \geq m$]
(b)

Sol2 → (3,1) be added
(b)

Sol3 → we know $AA^{-1} = I \xrightarrow{\text{Take det}} |AA^{-1}| = |I|$
(b) $|A||A^{-1}| = 1 \rightarrow |A^{-1}| = \frac{1}{|A|}$

Sol4 → $|A| = 0 \rightarrow 6(-2-10) - x(4+20) + 2(10-10) = 0$
(a) $-72 - 24x = 0 \rightarrow x = -3$

Sol5 → $|3A| = k|A| \rightarrow 3^3|A| = k|A| \rightarrow$ $27 = k$
(b)

Sol6 For Unique $|A| \neq 0 \rightarrow 1(k+2) - 1(2k+3) + 1(4-3) = 0$
(b) $k+2-2k-3+1 \neq 0 \rightarrow -k = 0 \quad k \neq 0 \rightarrow R - \{0\}$

Sol7 at 1.5 only (b)

Sol8 → $f'(x) = 6x^2 + 18x + 12 = 0 \rightarrow x^2 + 3x + 2 = 0 \rightarrow x = -2, -1$
(b) +   −   +   Dec $[-2, -1]$
$-2 \quad -1$

Sol9 → $\int \frac{\sin^3 x + \cos^3 x}{\sin^2 x \cos^2 x} \rightarrow \int \frac{\sin^3 x}{\sin^2 x \cos^2 x} + \int \frac{\cos^3 x}{\sin^2 x \cos^2 x}$
(b) $\int \sec x \tan x\, dx + \int \operatorname{cosec} x \cot x\, dx = \sec x - \operatorname{cosec} x + C$

Sol10 → use $\int e^x\{f(x) + f'(x)\} = e^x f(x) \rightarrow e^x \log|\sec x| + C$
(a)

Sol11 → $\frac{1}{4}\int_0^a \frac{dx}{\frac{1}{4} + x^2} \rightarrow \frac{1}{4}\left[\tan^{-1} 2x\right]_0^a = \frac{1}{2}\tan^{-1} 2a = \frac{\pi}{8}$
(b)
$\tan^{-1} 2a = \frac{\pi}{4} \rightarrow 2a = \tan\frac{\pi}{4} \rightarrow 2a = 1 \rightarrow a = \frac{1}{2}$

Sol 12 $I = \int_0^2 \frac{\sqrt{x}}{\sqrt{x}+\sqrt{2-x}}$ — (1)

use properties $I = \int_0^2 \frac{\sqrt{2-x}}{\sqrt{2-x}+\sqrt{2-2+x}}\, dx = \int_0^2 \frac{\sqrt{2-x}}{\sqrt{2-x}+\sqrt{x}}$ — (2)

(a)

add (1)+(2) we get $2I = \int_0^2 dx = 2I = |x|_0^2 \rightarrow 2I = 2 \rightarrow I = 1$

Sol 13 $\frac{dy}{dx} + y\frac{\sin x}{\cos x} = \frac{1}{\cos x} \rightarrow \frac{dy}{dx} + y\tan x = \sec x$

(c) $e^{\int P dx} = e^{\int \tan x} = e^{\log \sec x}$ $\quad \frac{dy}{dx} + Py = Q$ $\quad P = \tan x$

$= \sec x$

Sol 14 use

$|a+b+c|^2 = |a|^2+|b|^2+|c|^2 + 2a.b + 2b.c + 2c.a \rightarrow$

(b) $0 = 25+144+169+2x \rightarrow 2x = -338 \rightarrow x = -169$

Sol 15

$\theta = 90$ $\quad |a+b|^2 = |a|^2+|b|^2+2a.b$

$= 1+1+2|a||b|\cos\theta$

$= 2+2\cos 90 = 2$

(c) $|a+b|^2 = 2 \rightarrow |a+b| = \sqrt{2}$

Sol 16 For intersect $\begin{vmatrix} x_2-x_1 & y_2-y_1 & z_2-z_1 \\ l_1 & m_1 & n_1 \\ l_2 & m_2 & n_2 \end{vmatrix} = 0$

(b)

$\begin{vmatrix} 3-1 & k+1 & 0-1 \\ 2 & 3 & 4 \\ 1 & 2 & 1 \end{vmatrix} = \begin{vmatrix} 2 & k+1 & -1 \\ 2 & 3 & 4 \\ 1 & 2 & 1 \end{vmatrix} = 0 \rightarrow$

$2(3-8) - k+1(2-4) - 1(4-3) = 0 \rightarrow -10 + 2(k+1) - 1 = 0$

$2(k+1) = 11 \rightarrow 2k+2 = 11 \rightarrow 2k = 9 \rightarrow k = \frac{9}{2}$

Sol 17 $\frac{x}{1} = \frac{y}{-1} = \frac{z}{\frac{1}{k}}$ and $\frac{x}{k} = \frac{y}{-k} = \frac{z}{1} \rightarrow$ — (1)

(a) $\frac{x-1}{1} = \frac{y+\frac{1}{2}}{\frac{1}{2}} = \frac{z-1}{-1}$ — (2) $\rightarrow \frac{x-9}{2} = \frac{y+\frac{1}{2}}{1} = \frac{z-1}{-2}$ — (2)

$2x + 1(-k) + 1(-2) = 0 \rightarrow k = 2$

Sol 18 $P(A'/B) = \frac{P(A'\cap B)}{P(B)} = \frac{P(B)-P(A\cap B)}{P(B)} = 1 - \frac{\frac{4}{13}}{\frac{9}{13}}$

(c)

$1-\frac{4}{9} = \frac{5}{9}$

Sol 19 → a.

Sol 20 → c.

Sol 21 Let $A = \{1,2\}$

Identity Relation is $\{(1,1)\ (2,2)\}$
Reflexive $\{(1,1)(2,2)(1,2)\}$
we observe Id ⊆ Reflexive

Sol 22 $\tan^{-1}\tan\left(\pi-\frac{\pi}{6}\right) + \cos^{-1}\cos\left(2\pi+\frac{\pi}{6}\right)$

$-\tan^{-1}\tan\frac{\pi}{6}+\cos^{-1}\cos\frac{\pi}{6} \to -\frac{\pi}{6}+\frac{\pi}{6}=0$

Sol 23 $a=-\frac{3}{2}$, b = Any Real no. except zero, $c=\frac{1}{2}$

OR $\lim_{x\to 2} \frac{(x-2)^2(x+5)}{(x-2)^2} = 2+5=7$

Sol 24 $\int_{\frac{1}{3}}^{1} \frac{x\left(\frac{1}{x^2}-1\right)^{\frac{1}{3}}}{x^4 x^3}\,dx$ Put $\frac{1}{x^2}-1=t$ → $-\frac{1}{2}\int_{8}^{0} t^{\frac{1}{3}}dt = \frac{1}{2}\left[\frac{3}{4}t^{\frac{4}{3}}\right]_0^8$
$=6$

OR Put $\sin x-\cos x=t$, we get $\frac{1}{40}\log 9$

Sol 25 use $\frac{(\vec{a}_2-\vec{a}_1)\cdot(\vec{b}_1\times\vec{b}_2)}{|\vec{b}_1\times\vec{b}_2|} = \frac{1}{\sqrt{6}}$.

Sol 26 For One-One $f(x_1)=f(x_2) \to \frac{4x_1+3}{6x_1-4} = \frac{4x_2+3}{6x_2-4}$

$-34x_1=-34x_2 \to x_1=x_2$

Range $y=\frac{4x+3}{6x-4} \to x=\frac{4y+3}{6y-4}$ $6y-4\neq 0$
$y\neq\frac{2}{3}$

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Preboard Set-2
Maths 24-11-25

Sol1 — a

Sol2 → Concept $\frac{a-b}{2}$ → $\frac{a-0}{2}, \frac{0-0}{2}, \frac{2-0}{2}, \frac{4-0}{2}, \ldots$
a $\{0, 2, 4\}$

Sol3 → $7A - (I+A)^3$ → Expand and solve we get $-I$
b

Sol4 → 3×4 → a

Sol5 → 99 — a Concept $A^2 = \begin{bmatrix} 2 & 2 \\ 2 & 2 \end{bmatrix}$, $A^3 = \begin{bmatrix} 4 & 4 \\ 4 & 4 \end{bmatrix}$ .... $A^{100} = 2^{99}\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$
$A^{100} = 2^{99} A \quad \therefore K = 99$

Sol6 → c $A^2 + B^2 = AA + BB$
$A(BA) + B(AB) = AB(A) + BA(B)$ [Assoc
$= BA + AB = A + B$

Sol7 1.5 → b

Sol8 → $[2, -1]$ — b

Sol9 → c

Sol10 → a

Sol11 → d

Sol12 → b → odd fn $\therefore I = 0$

Sol13 → c → $\sec x$

Sol14 → b → -169

Sol15 → c → $\sqrt{2}$.

Sol16 → a → 2.

Sol17 → $|a \times b| = |a||b| \sin\theta = 4 \times 3 \times \sin\theta$
$= 4 \times 3 \times \sin 30$
$= 4 \times 3 \times \frac{1}{2} = 6$
d $|a \times b| = 6$

$a \cdot b = |a||b| \cos\theta$
$6\sqrt{3} = 4 \times 3 \times \cos\theta$
$\cos\theta = \frac{6\sqrt{3}}{12} = \frac{\sqrt{3}}{2}$
$\theta = 30$

25 → Set-1 Ans $\frac{1}{36}$

26 → <u>For one-one</u> $f(x_1) = f(x_2) \rightarrow 9(x_1^2 - x_2^2) + 6(x_1 - x_2) = 0$

$3\left[3(x_1 + x_2) + 2\right](x_1 - x_2) = 0$

but $x_1 - x_2 = 0$ and $3(x_1 + x_2) + 2 \neq 0$ as $x_1, x_2 \in R_+$

$\Rightarrow x_1 = x_2$.

<u>For onto</u> Find Range $9x^2 + 6x - 5 = y \rightarrow 9x^2 + 6x - (5+y) = 0$

$$\frac{-6 \pm \sqrt{36 + 4.9(5+y)}}{18} \rightarrow x = \frac{-1 \pm \sqrt{y+6}}{3}$$

Since $x \geq 0$ given $\quad -1 \pm \sqrt{y+6} \geq 0 \rightarrow \sqrt{y+6} \geq 1 \rightarrow y+6 \geq 1$

$y \geq -5$

∴ Range = Codomain ∴ onto

OR (i) $A = \{1, 2\}$, $B = \{4, 5, 6\}$ | (ii) $A = \{1, 2, 3\}$, $B = \{4, 5\}$ | $A = \{1, 2, 3\}$, $B = \{4, 5\}$

<u>Sol 27</u> $f'(x) = -6(x+1)(x+2) \rightarrow \quad - \;\; \underset{-2}{|} \;\; + \;\; \underset{-1}{|} \;\; -$

Incre $= (-\infty, -2) \cup (-1, \infty)$ $\qquad$ Dec $= (-2, -1)$

OR $f'(x) = 12\cos x\,(\sin^2 x - \sin x + 1) = 0$
→ roots are not possible

$\underset{0}{} \;\; + \;\; \underset{\frac{\pi}{2}}{|} \;\; - \;\; \underset{}{\pi}$ $\quad$ Incr $\left[0, \frac{\pi}{2}\right)$ and Dec $\left(\frac{\pi}{2}, \pi\right]$

<u>Sol 28</u> Put $x = t^6 \rightarrow 2\sqrt{x} - 3x^{\frac{1}{3}} + 6x^{\frac{1}{6}} - 6\log\left|x^{\frac{1}{6}} + 1\right| + C$

<u>Sol 29</u> Ans 4 Sq. Unit In Set-1

<u>Sol 30</u> Set-1

<u>Sol 31</u>

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23. A bag contains $(2n+1)$ coins. It is known that 'n' of these coins have a head on both its sides whereas the rest of the coins are fair. A coin is picked up at random from the bag and is tossed. If the probability that the toss results in a head is $\frac{31}{42}$, find the value of 'n'.

Sol-31

Solution. Let us define the following events :

A_1 : a coin having head on both sides is selected.

A_2 : a fair coin is selected.

B : head comes up in tossing a selected coin.

Then $P(A_1) = \frac{n}{2n+1}$, $P(A_2) = \frac{n+1}{2n+1}$

$P(B/A_1)$ = Probability that head comes up when a both sides head coin is selected $= 1$

$P(B/A_2)$ = Probability that head comes up when a fair coin is selected $= \frac{1}{2}$

$$\begin{aligned} P(B) &= P(A_1 \cap B) + P(A_2 \cap B) \\ &= P(A_1)P(B/A_1) + P(A_2)P(B/A_2) \\ &= \frac{n}{2n+1} \cdot 1 + \frac{n+1}{2n+1} \cdot \frac{1}{2} = \frac{1}{2n+1}\left[n + \frac{n+1}{2}\right] = \frac{1}{2n+1}\left[\frac{2n+n+1}{2}\right] = \frac{3n+1}{2(2n+1)} \end{aligned}$$

It is given that $P(B) = \frac{31}{42}$

$\therefore \frac{3n+1}{2(2n+1)} = \frac{31}{42}$

$\Rightarrow \frac{3n+1}{2n+1} = \frac{31}{21}$

$\Rightarrow 21(3n+1) = 31(2n+1)$

$63n - 62n = 31 - 21$

$n = 10$

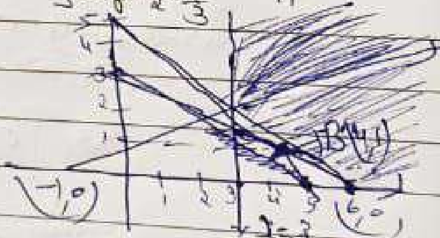
OR $P(E_1) = \frac{2}{6} = \frac{1}{3}$ $A \to$ Exactly one head $P(A/E_1) = \frac{3}{8}$

$P(E_2) = \frac{4}{6} = \frac{2}{3}$ $P(A/E_2) = \frac{1}{2}$

$P(E_2/A) = \frac{\frac{2}{3} \times \frac{1}{2}}{\frac{1}{3} \times \frac{3}{8} + \frac{1}{2} \times \frac{2}{3}} = \frac{8}{11}$

Sol 32
Sol 33
Sol 34 → In Sol 1
Sol 35
Sol 36

Sol 34



$-x+2y=1$ Z

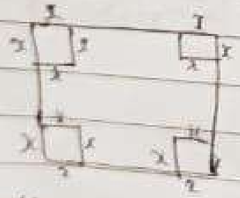
$A(6,0) = -6$

$B(4,1) = -2$

$C(3,2) = 1$ Check

No max.

Sol 37



(i) $V = (40-2x)(25-2x)x =$
$= 1000x - 130x^2 + 4x^3$

(ii) $\frac{dV}{dx} = 3x^2 - 65x + 250 = 0$

(iii) If $\frac{dV}{dx} = 0$, $x = 5$

Sol 38 (i) $2^{3\times 2} = 2^6$

$n = 3 \to$ Boy
$n = 2 \to$ Girls

(ii) $B \to G \to n^m = 2^3$

(iii) One-one $n \geq m$ No One-One = Zero

Onto $n \leq m$ $\sum_{r=1}^{n} (-1)^{n-r}\, {}^nC_r\, r^m = (-1)^{2-1}\, {}^2C_1(1)^3 + (-1)^{2-2}\, {}^2C_2(2)^3$

$= -2 + 8 = 6$