

Q. No. 2 Part (i)

$$x = \sqrt{5} + 2$$

$$\frac{1}{\sqrt{5} + 2} \times \frac{\sqrt{5} - 2}{\sqrt{5} - 2}$$

$$= \frac{\sqrt{5} - 2}{(\sqrt{5})^2 - (2)^2} = \frac{\sqrt{5} - 2}{5 - 4} = \frac{\sqrt{5} - 2}{1}$$

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

$$a) \quad x + \frac{1}{x} = \sqrt{5} + 2 + \sqrt{5} - 2 = 2\sqrt{5}$$

$$b) \quad x - \frac{1}{x} = \frac{(\sqrt{5} + 2) - (\sqrt{5} - 2)}{\sqrt{5} + 2 - \sqrt{5} + 2} = 4$$

$$c) \quad x^2 - \frac{1}{x^2} = (2\sqrt{5})(4) = 8\sqrt{5}$$

Q. No. 2 Part (ii) $P(y) = y^4 + \frac{3y^3}{2} - y^2 + 1$

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

$$P(-2) = \frac{16 + 3(-8)}{2} - (4) + 1$$

$$P(-2) = \frac{16 + (-24)}{2} - 4 + 1$$

$$P(-2) = 16 - 12 - 4 + 1$$

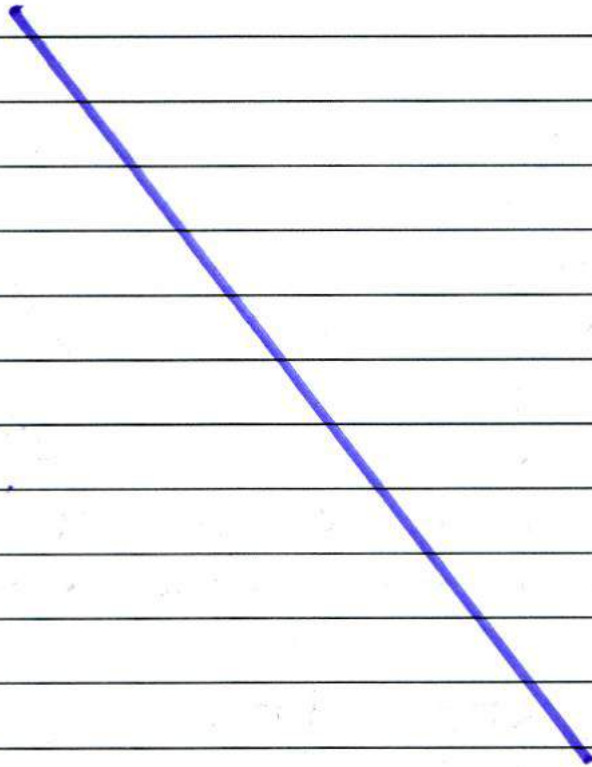
$$P(-2) = 1$$

Q. No. 2 Part (iii) $x - 8xy^3$

$$x(1 - 8y^3)$$
$$x[(1)^3 - (2y)^3]$$

$$x(1 - 2y)[(1)^2 + (1)(2y) + (2y)^2]$$

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



Q. No. 2 Part (vi) L.H.S $(A+B)^t$

$$A+B = \begin{bmatrix} 2 & 4 \\ 1 & 5 \end{bmatrix} + \begin{bmatrix} 3 & -2 \\ 4 & 6 \end{bmatrix}$$

$$A+B = \begin{bmatrix} 2+3 & 4-2 \\ 1+4 & 5+6 \end{bmatrix}$$

$$A+B = \begin{bmatrix} 5 & 2 \\ 5 & 11 \end{bmatrix}$$

$$(A+B)^t = \begin{bmatrix} 5 & 5 \\ 2 & 11 \end{bmatrix}$$

R.H.S

$A^t + B^t$

$$A = \begin{bmatrix} 2 & 4 \\ 1 & 5 \end{bmatrix}$$

$$A^t = \begin{bmatrix} 2 & 1 \\ 4 & 5 \end{bmatrix}$$

$$B = \begin{bmatrix} 3 & -2 \\ 4 & 6 \end{bmatrix}$$

$$B^t = \begin{bmatrix} 3 & 4 \\ -2 & 6 \end{bmatrix}$$

$$A^t + B^t = \begin{bmatrix} 2 & 1 \\ 4 & 5 \end{bmatrix} + \begin{bmatrix} 3 & 4 \\ -2 & 6 \end{bmatrix}$$

$$A^t + B^t = \begin{bmatrix} 2+3 & 1+4 \\ 4-2 & 5+6 \end{bmatrix}$$

$$A^t + B^t = \begin{bmatrix} 5 & 5 \\ 2 & 11 \end{bmatrix}$$

L.H.S = R.H.S

Hence it is verified that $(A+B)^t = A^t + B^t$

Q. No. 2 Part ^{ix} ~~(ix)~~ area of a rectangular field = 2.5
 $2.5 \times 10,000$
 $= 25000$

ratio = 3:2

let length = $3x$, breadth = $2x$

perimeter = $2(L+b)$

$$2(3x+2x)$$

$$2(5x)$$

$$= 10x$$

Area of a field = $L \times b$

$$25000 = (3x)(2x)$$

$$25000 = 6x^2$$

$$x^2 = \frac{25000}{6}$$

6

$$x^2 = 4166.67$$

Taking sq. root

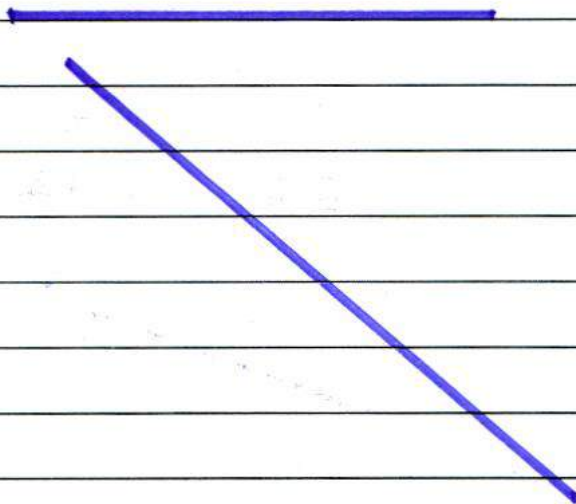
$$x^2 = \sqrt{4166.67}$$

$$x = 64.5$$

perimeter of the field = $10(x)$

$$10(64.5)$$

$$= \underline{645m}$$



Q. No. 2 Part (iv)

$$P(x) = 3x^3 + Kx - 26$$

$$x - 2 = 0$$

$$x = 2$$

put $x = 2$

$$3(2)^3 + K(2) - 26$$

$$3(8) + 2K - 26$$

$$R = 24 + 2K - 26$$

Since $R = 0$

$$0 = 24 + 2K - 26$$

$$2K = 2$$

$$K = \frac{2}{2}$$

$$K = 1$$

Q. No. 2 Part (xi) $m-13 = \sqrt{m+17}$

Taking square on both sides:

$$(m-13)^2 = (\sqrt{m+17})^2$$

$$m^2 + 13^2 - 2(m)(13) = m + 17$$

$$m^2 + 169 - 26m = m + 17$$

$$m^2 - 26m - m =$$

$$m^2 - 26m + 169 = m + 17$$

$$m^2 - 26m - m + 169 - 17 = 0$$

$$m^2 - 27m + 162 = 0$$

$$m^2 - 18m - 9m + 162 = 0$$

$$m(m-18) - 9(m-18) = 0$$

$$(m-18)(m-9) = 0$$

$$m-18=0 \quad m-9=0$$

$$m=18$$

$$m=9$$

Check:-

put $m=18$

$$18-13 = \sqrt{18+17}$$

$$5 = \sqrt{35}$$

Taking sq.

on both sides:

$$(m-13)^2 = (\sqrt{m+17})^2$$

$$m^2 + 169 - 26m = m + 17$$

$$m^2 - 26m + 169 = m + 17$$

$$m^2 - 26m - m +$$

$$169 - 17 = 0$$

$$m^2 - 27m +$$

$$152 = 0$$

$$m^2 - 19m - 8m$$

$$+ 152 = 0$$

$$m(m-19) - 8$$

$$(m-19) = 0$$

$$(m-19)(m-8) = 0$$

$$m-19=0 \quad m-8=0$$

$$m=19, \quad m=8$$

Check:

put $m=19$

$$19-13 = \sqrt{19+17}$$

$$6 = \sqrt{36}$$

$$6 = 6 \text{ (satisfied)}$$

put $m=8$

$$8-13 = \sqrt{8+17}$$

$$-5 = \sqrt{25}$$

$$-5 = 5$$

(unsatisfied)

$$\text{Solset} = \{19\}$$

$$\text{extraneous root} = \{8\}$$

Q. No. 2 Part (vii) **(a) AB** $\begin{bmatrix} 5 & 2 \\ 2 & 1 \end{bmatrix} \begin{bmatrix} 4 & 2 \\ 3 & -1 \end{bmatrix}$

$$\begin{bmatrix} (5 \times 4) + (2 \times 3) & (5 \times 2) + (2 \times -1) \\ (2 \times 4) + (1 \times 3) & (2 \times 2) + (1 \times -1) \end{bmatrix}$$

$$AB = \begin{bmatrix} 20 + 6 & 10 - 2 \\ 8 + 3 & 4 - 1 \end{bmatrix} = \begin{bmatrix} 26 & 8 \\ 11 & 3 \end{bmatrix}$$

(b) |AB| = $\begin{vmatrix} 26 & 8 \\ 11 & 3 \end{vmatrix} = (26 \times 3) - (8 \times 11)$
 $= (78) - (88)$
 $= -10 \neq 0$

(non-singular)

(c) adj(AB)

$$\begin{bmatrix} 3 & -8 \\ -11 & 26 \end{bmatrix}$$

(d) (AB)⁻¹ $AB^{-1} = \frac{1}{-10} \cdot \begin{bmatrix} 3 & -8 \\ -11 & 26 \end{bmatrix}$

~~(AB)⁻¹ = X B X = (AB)⁻¹ B~~

~~$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{-10} \begin{bmatrix} 3 & -8 \\ -11 & 26 \end{bmatrix} \begin{bmatrix} 4 & 2 \\ 3 & -1 \end{bmatrix}$~~

$$(AB)^{-1} = \begin{bmatrix} 3 \times \frac{1}{-10} & -8 \times \frac{1}{-10} \\ -11 \times \frac{1}{-10} & 26 \times \frac{1}{-10} \end{bmatrix}$$

$$(AB)^{-1} = \begin{bmatrix} -3/10 & 4/5 \\ 11/10 & -13/5 \end{bmatrix}$$

Q. No. 2 Part (x) length = 6.3m
breadth = 4.5m
depth = 3.6m

$$\begin{aligned}\text{Volume of a storage tank} &= 6.3 \times 4.5 \times 3.6 \times \\ &\quad 100 \times 100 \times 100 \\ &= 102060000 \text{ litres.}\end{aligned}$$

Q. No. 3 (Page 1/2) $(a+b+c)^2 = ?$

Given:-

$$a^2 + b^2 + c^2 = 32$$

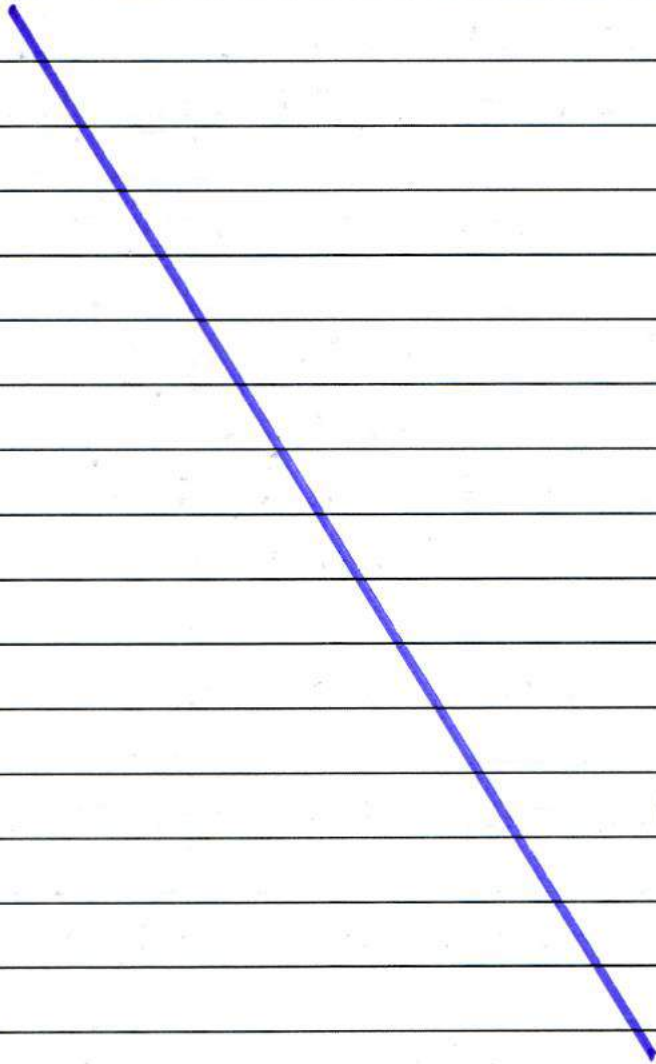
$$ab + bc + ca = 7$$

formula:- $(a+b+c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

Solution:- $(a+b+c)^2 = 32 + 2(7)$

$$(a+b+c)^2 = 32 + 14$$

$$(a+b+c)^2 = 46$$



Q. No. 6 (Page 1/2) From the given pts. we will find \overline{AB} , \overline{BC} , \overline{CA}

$$\overline{AB} = A(6,1), B(2,7)$$

$$\overline{AB} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$\overline{AB} = \sqrt{(2-6)^2 + (7-1)^2}$$

$$\overline{AB} = \sqrt{(-4)^2 + (6)^2}$$

$$= \sqrt{16 + 36}$$

$$= \sqrt{52} \rightarrow (i)$$

$$= 2\sqrt{13}$$

$$\overline{BC} = B(2,7), C(-6,-7)$$

$$\overline{BC} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$= \sqrt{(-6-2)^2 + (-7-7)^2}$$

$$= \sqrt{(-8)^2 + (-14)^2}$$

$$= \sqrt{64 + 196}$$

$$= \sqrt{260} \rightarrow (ii)$$

$$\overline{CA} = C(-6,-7), A(6,1)$$

$$\overline{CA} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$= \sqrt{(6+6)^2 + (1+7)^2}$$

$$= \sqrt{3(12)^2 + (8)^2}$$

$$= \sqrt{144 + 64}$$

$$= \sqrt{208} \rightarrow (iii)$$

By pythagoras Theorem:

$$(ii) = (i) + (iii)$$

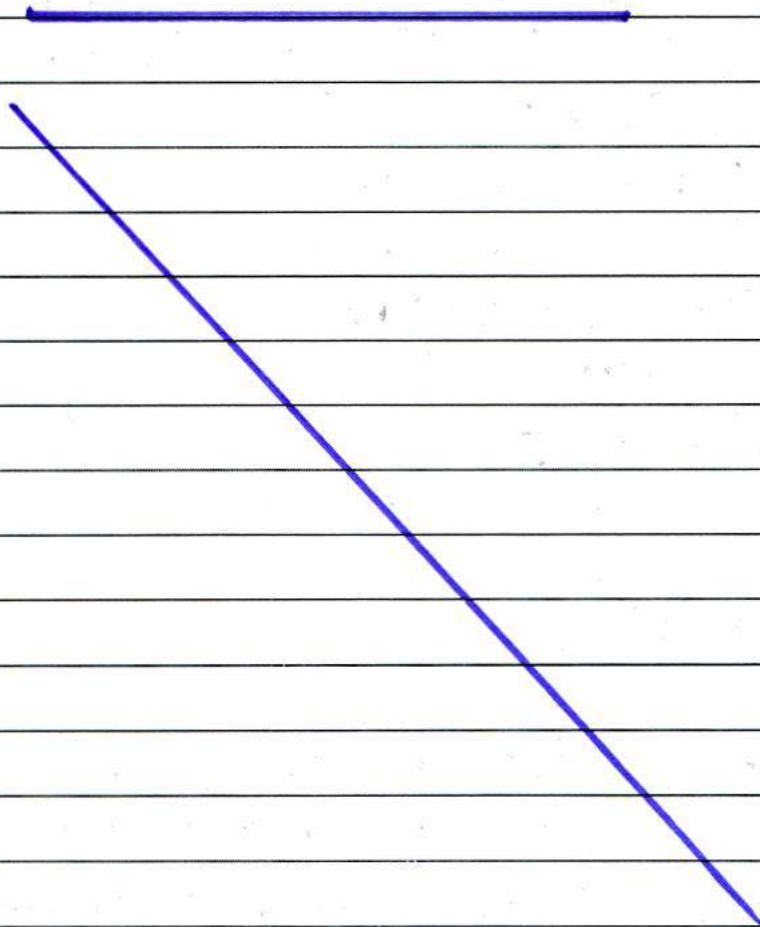
$$|BC| = |AB| + |CA|$$

$$(\sqrt{260})^2 = (\sqrt{52})^2 + (\sqrt{208})^2$$

$$260 = 52 + 208$$

$$260 = 52 + 208$$

Hence it is proved that given pts.
are the vertices of right triangle.



Q. No. 4 (Page 1/2)

$$x + y = 2$$

$$y = 2 + x$$

$$x + y = 2$$

$$y - x + y = 2$$

Writing in matrix form:

$$\begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 \\ 2 \end{bmatrix}$$

$$A \quad X = B$$

$$A = \begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix}, \quad X = \begin{bmatrix} x \\ y \end{bmatrix}, \quad B = \begin{bmatrix} 2 \\ 2 \end{bmatrix}$$

$$|A| = \begin{vmatrix} 1 & 1 \\ -1 & 1 \end{vmatrix} = (1 \times 1) - (1 \times -1)$$

$$1 + 1$$

$$(\text{non-singular}) = 2 \neq 0$$

Solution is possible.

A^{-1} exists.

$$\text{adj } A = \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix}$$

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

$$A^{-1} = \frac{1}{2} \circ \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix}$$

$$X = A^{-1} B$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{2} \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} 2 \\ 2 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{2} \begin{bmatrix} (1 \times 2) + (-1 \times 2) \\ (1 \times 2) + (1 \times 2) \end{bmatrix}$$

(Page 2/2)

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{2} \begin{bmatrix} 2-2 \\ 2+2 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{2} \begin{bmatrix} 0 \\ 4 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 0 \times \frac{1}{2} \\ 4 \times \frac{1}{2} \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 0 \\ 2 \end{bmatrix}$$

$$\text{Solset} = \{ (0, 2) \}$$

