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

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

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

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

put $y = -2$

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

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

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

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

$$\boxed{P(-2) = 1}$$

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) 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 $= L \times b$
$$25000 = (3x)(2x)$$
$$25000 = 6x^2$$
$$x^2 = \frac{25000}{6}$$
$$x^2 = 4166.67$$

Taking sq. root
$$x^2 = \sqrt{4166.67}$$
$$x = 64.5$$

perimeter of the field $= 10(x)$
$$10(64.5)$$
$$= 645m$$

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 $R = 0$

$0 = 24 + 2K - 26$

$2K = 2$

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

$\boxed{K = 1}$

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

Taking square on both sides:

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

$m^2+13^2-2(m)(13)=m+7$

$m^2+169-26m=m+7$

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

$m^2-26m+169=m+7$

$m^2-26m-m+169-7=0$

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

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

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

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

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

$m=18 \quad m=9$

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 $m=19$

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

$6=\sqrt{36}$

$6=6$ (satisfied)

put $m=8$

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

$-5=\sqrt{25}$

$-5\neq 5$

(unsatisfied)

Solset $=\{19\}$

extraneous root $=\{8\}$

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

$$\begin{bmatrix} (5\times4)+(2\times3) & (5\times2)+(2\times-1) \\ (2\times4)+(1\times3) & (2\times2)+(1\times-1) \end{bmatrix}$$

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

(b) $|AB| = \begin{vmatrix} 26 & 8 \\ 11 & 3 \end{vmatrix}$ $(26\times3)-(8\times11)$

$(78)-(88)$

$-10 \neq 0$

(non-singular)

(c) adj (AB)

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

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

~~$(AB)^{-1} = X\,B$ $X = (AB)^{-1}\,B$~~

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

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

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

Q. No. 2 Part (X) length = 6·3m
breadth = 4·5m
depth = 3·6m

Volume of a storage tank = 6·3 x 4·5 x 3·6 x 100 x 100 x 100
= 102060000 litres.

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

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

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

(Page 2/2)

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

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

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

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

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

$= \sqrt{16+36}$

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

$= \cancel{2\sqrt{13}}$

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

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

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

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

$= \sqrt{64+196}$

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

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

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

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

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

$= \sqrt{144+64}$

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

By pythagoras Theorem:

$$(ii) = (i) + (iii)$$
$$|\overline{BC}| = |\overline{AB}| + |\overline{CA}|$$
$$(\sqrt{260})^2 = (\sqrt{52})^2 + (\sqrt{208})^2$$
$$260 = 52 + 208$$
$$260 = 52 + 208$$

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

Q. No. 4 (Page 1/2) $x+y=2$

$y=2+x$

$x+y=2$ $\qquad$ $\cancel{y}\ -x+y=2$

Writing in matrix form:

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

$$A \quad X = B$$

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

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

$$1+1$$

(non-singular) $= 2 \neq 0$

Solution is possible.

A^{-1} exists.

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

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

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

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

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

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

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

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

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

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

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