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Ans-1 Actual length = $r_1 = 12.5$ cm

Actual area $= \pi r_1^2$

$= \pi (12.5)^2 = 490.87365\ cm^2$

$r_2 = 12.65$ cm

Approximate area $= \pi r_2^2$

$= \pi (12.65)^2$

$= 502.72551\ cm^2$

i) Absolute Error = Approximate Area − Actual Area

$= 502.72551 - 490.87365$

$= 11.84886\ cm^2$

ii) Relative Error = $\dfrac{\text{Absolute Error}}{\text{Actual Error}} = \dfrac{11.84886}{490.87365}$

$= 0.0241383093$

iii) Percentage Error = Relative Error $\times 100$

$= 2.41383093\ \%$

Ans-2 i) $x_1 = 4$

$y_1 = 0.60206$

$x_2 = 6$

$y_2 = 0.7781513$

$x_2 - x_1 = y_2 - y_1$ ($\because$ Linear Interpolation)

$6 - 4 = 0.7781513 - 0.60206$

Charge $= \dfrac{0.1760913}{2}$

Charge $= 0.08804565$

$\therefore$ $x = 5$

$y = 0.60206 + 0.08804565$

$= 0.69010565$

ii) $x_1 = 4.5$

$y_1 = 0.6532125$

$x_2 = 5.5$

$y_2 = 0.7403627$

$\therefore$ $5.5 - 4.5 = 0.7403627 - 0.6532125$

$\Rightarrow$ $1 = 0.0871502$

Charge $= 0.0871502$

$\therefore$ $x = 5$

$y = 0.6532125 + 0.0871502$

$= 0.6967876$

Ans-5 $A^2 = A$ (Given)

$7A - (I + A)^3 = -7A + (I^3 + A^3 + 3A^2 I + 3AI^2)$

$= -7A + (I^3 + A^2(A) + 3\cancel{A} I + 3AI^2)$

~~$7A - (A^2(A) + I^3 + \{3A(I)$~~

$= -7A + (I + A^2(A) + 3AI + 3AI^2)$

$= -7A + I + A^2 + 6A$

$= -A + I + A$

$= I$

Ans-6 $A = \begin{bmatrix} 1 & -1 & 2 \\ 4 & 0 & 6 \\ 0 & 1 & -1 \end{bmatrix}$

$|A| = 0 - (6 - 8) + (-1)4$

$= 2 - 4$

$= -2$

$Adj(A) = \begin{bmatrix} -6 & 1 & -6 \\ 4 & -1 & 2 \\ 4 & -1 & 4 \end{bmatrix}$

$A^{-1} = \frac{Adj(A)}{|A|}$

$= \frac{-1}{2} \begin{bmatrix} -6 & 1 & -6 \\ 4 & -1 & 2 \\ 4 & -1 & 4 \end{bmatrix}$

$A^{-1} = \begin{bmatrix} 3 & -1/2 & 3 \\ -2 & 1/2 & -1 \\ 2 & 1/2 & -2 \end{bmatrix}$

Ans-7 $\vec{a} = 8i - 9j$

$\vec{b} = 7i - 9j$

$\vec{a}\cdot\vec{b} = ab\cos\theta$

$= (8i - 9j)(7i - 9j)$

$= 56 + 81 = 137$

$a = \cancel{\sqrt{\ }} + \sqrt{64+72} = \sqrt{145}$

$b = \sqrt{49+81} = \sqrt{130}$

$\vec{a}\cdot\vec{b} = ab\cos\theta$

$\cos\theta = \dfrac{\vec{a}\cdot\vec{b}}{ab}$

$= \dfrac{137}{137.295302}$

$= 0.99806 7232$

Ans-8 $\vec{R} = \vec{a} + \vec{b}$

$R^2 = A^2 + B^2 + 2AB\cos\theta$

$\theta = 30°$ (Given)

$R^2 = (75)^2 + (25)^2 + 2(75)(25)\cos 30$

$R^2 = 5625 + 625 + 3750\cos 30°$

$= 9497.595284$

Ans-9 $d = 3$

AP = 101, 104, 107, 110 998

$a = 101$

$a_n = a + (n-1)d$

$998 = 101 + (n-1)3$

$897 = 3n - 3$

$900 = 3n$

$n = 300$

$S_n = \frac{n}{2}(a_n + a)$

$= \frac{300}{2}(998 + 101)$

$= 150 \times 1099$

$= 164850$

Ans-10 $a_6 = 32$

$a_8 = 128$

$\frac{a r^{\cancel{7}}}{a r^5} = \frac{128}{32}$

$r^2 = 4$

$r = 2$

Ans-11 $(3x+4)^5 = (3x)^5 + 5(3x)^4 4 + 10(3x^3)4^2 + 10(3x^2)4^3 + 5(3x)4^4 + 4^5$

$(3x+4)^5 = 243x^5 + 1620x^4 + 4320x^3 + 5760x^2 + 3840x + 1024$

Ans-14 $(x^2 - x + 1)^4 = ((x^{\cancel{2}} - 1)^2 + x)^4$

Using Pascal's triangle,

$[(x-1)^2 + x]^4 = (x-1)^8 + 4(x-1)^6 x + 6(x-1)^4 x^2 + 4(x-1)^2 x^3 + x^4$

$$= (x-1)^8 + 4x(x-1)^6 + (x-1)^4 6x^2 + 4x^3(x-1)^2 + x^4$$

Ans-12 $A = \begin{bmatrix} 2 & -3 & 0 \\ 2 & -5 & 0 \\ 0 & 0 & 3 \end{bmatrix}$

$$A - \lambda I = \begin{bmatrix} 2 & -3 & 0 \\ 2 & -5 & 0 \\ 0 & 0 & 3 \end{bmatrix} - \begin{bmatrix} \lambda & 0 & 0 \\ 0 & \lambda & 0 \\ 0 & 0 & \lambda \end{bmatrix}$$

$$= \begin{bmatrix} 2-\lambda & -3 & 0 \\ 2 & -5-\lambda & 0 \\ 0 & 0 & 3-\lambda \end{bmatrix}$$

$$|A - \lambda I| = -\lambda^3 + 13\lambda - 12$$

$$-\lambda^3 + 13\lambda - 12 = 0$$

$$\lambda^3 - 13\lambda + 12 = 0$$

Comparing Coefficient

1) $1 - 13 + 12 = 0$

$$\lambda^2 - \lambda - 12 = 0$$

$$\lambda^2 + 4\lambda - 3\lambda - 12 = 0$$

$$\lambda = 3 \text{ or } -4$$