C2 - 2

Batch COMPS Roll No. 1601012410?

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Course:

Experiment / assignment / tutorial No. 5

Grade | Signature of the Faculty with date

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1) Show: $\sin^5\theta = \frac{1}{16}(\sin 5\theta - 5\sin 3\theta + 10\sin\theta)$

$= \frac{1}{16}\left[(5\sin\theta - 20\sin^3\theta + 16\sin^5\theta)\right.$ — result Ⓐ

$\left. - 5(3\sin\theta - 4\sin^3\theta) + 10\sin\theta\right]$

$= \frac{1}{16}\left(\sin\theta(5-15+10) + \sin^3\theta(-20+20) + \sin^5\theta(16)\right]$

$= \frac{1}{16}\left(0 + 0 + 16\sin^5\theta\right)$

$= \sin^5\theta$

... hence proved.

Calculating result Ⓐ

$\sin 5\theta = \sin(2\theta + 3\theta) = \sin 2\theta\cos 3\theta + \cos 2\theta \sin 3\theta$

$(2\sin\theta\cos\theta)(4\cos^3\theta - 3\cos\theta) + (1 - \sin^2\theta)(3\sin\theta - 4\sin^3\theta)$

$= 8\sin\theta\cos^4\theta - 6\sin\theta\cos^2\theta + 3\sin\theta - 3\sin^3\theta - 4\sin^3\theta + 4\sin^5\theta$

(using identity & and simplifying)

$= 5\sin\theta - 20\sin^3\theta + 16\sin^5\theta$ — result Ⓐ

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2) $A = \begin{bmatrix} 1 & a & -1 \\ 3 & 4 & c \\ b & -6 & -7 \end{bmatrix}$

Given, A is symmetric.

$\therefore a_{ij} = a_{ji}$ for $\forall (i,j)$

By definition; $a_{21} = a_{12}$

$\therefore a = 3$

$a_{23} = a_{32}$; $c = -6$

$a_{31} = a_{13}$; $b = -1$

$\therefore$ a, b, and c are 3, -1, -6 respectively.

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3. $A = \begin{bmatrix} 1 & a & -1 \\ 3 & 4 & c \\ b & -6 & -7 \end{bmatrix}$ Substituting values: $\begin{bmatrix} 1 & 3 & -1 \\ 3 & 4 & -6 \\ -1 & -6 & -7 \end{bmatrix}$

$|A| = 1(-28-36) - 3(-21-6) - 1(-18+4)$

$= 1(-64) - 3(-27) - 1(-14)$

$= -64 + 81 + 14$

$= \cancel{159}\ 31$

adj A:

$A_{11} = -28-36 = -64 \times 1 = -64$

$A_{12} = -21-6 = -27 \times -1 = 27$

$A_{13} = -18+4 = -14 \times 1 = -14$

$A_{21} = -21-6 = -27 \times -1 = 27$

$A_{22} = -7-1 = -8 \times 1 = -8$

$A_{23} = -6+3 = -3 \times -1 = 3$

$A_{31} = -18+4 = -14 \times 1 = -14$

$A_{32} = -6+3 = -3 \times -1 = 3$

$A_{33} = 4-9 = -5 \times 1 = -5$

adj of A $= \begin{bmatrix} -64 & 27 & -14 \\ 27 & -8 & 3 \\ -14 & 3 & -5 \end{bmatrix}$

$A^{-1} = \dfrac{1}{|A|}$ adj A

$= \dfrac{1}{31} \begin{bmatrix} -64 & 27 & -14 \\ 27 & -8 & 3 \\ -14 & 3 & -5 \end{bmatrix}$

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4) A matrix is symmetric iff $A = A^T$ & skew symmetric iff $A = -A^T$.

i) ∴ let's check for $(A + A^T)$

$$(A + A^T)^T = A^T + (A^T)^T$$
$$= A^T + A$$

∴ transpose = original ; $(A^T + A)$ is symmetric

ii) $\cancel{A + A^T}$ $(A - A^T)^T = A^T - (A^T)^T$
$$= A^T - A$$
$$= -(A - A^T)$$

∴ transpose = − original
$A - A^T$ is skew symmetric