

Question Three

a)

$$i) \int (x^8 + 2x^2)(3x^2 + x) dx$$

$$3x^{10} + x^9 + 6x^4 + 2x^3$$

$$\boxed{\frac{3x^{11}}{11} + \frac{x^{10}}{10} + \frac{6x^5}{5} + \frac{2x^4}{4} + C}$$

$$ii) (e^x + 1)(e^x - 1) dx$$

$$e^2 - e^x + e^x - 1 \quad e^2 - 1 = \boxed{e^2 - x + C}$$

$$iii) \int (x+2)^3 + x - 1$$

$$(x+2)(x+2) (x^2 + 4x + 4) (x+2)$$

$$x^3 + 4x^2 + 4x + 2x^2 + 8x + 8$$

$$x^3 + 6x^2 + 12x + 8 + x - 1$$

$$x^3 + 6x^2 + 13x + 7$$

$$\frac{x^4}{4} + \frac{6x^3}{3} + \frac{13x^2}{2} + 7x - 1$$

$$\left[\frac{5^4}{4} + \frac{6(5^3)}{3} + \frac{13(5^2)}{2} + \frac{7 \times 5}{1} \right] - \left[\frac{2^4}{4} + \frac{6(2^3)}{3} + \frac{13(2^2)}{2} + \frac{7 \times 2}{1} \right]$$

$$156.25 + 250 + 162.5 + 35$$

$$4 + 24 + 26 + 14$$

$$568.75 -$$

$$603.75 - 44$$

$$\boxed{559.75}$$

Q1 V) $|A| \begin{pmatrix} 2 & -5 & 3 \\ -5 & 0 & 5 \\ 3 & 0 & 2 \end{pmatrix}$

$$|A| = 125$$

$$2(0-0) - 5(-10-15) + 3(0-0)$$

$$0 \cdot 125 \cdot 0$$

Q1 VI) $|B| \begin{pmatrix} -5 & 8 & 0 \\ 2 & 6 & 2 \\ 0 & -2 & 3 \end{pmatrix}$

$$|B| = -158$$

$$-5(18+4) - 8(6-0) + 0$$

$$-110 - 48$$

Q1 VII) $A+B \begin{pmatrix} 2 & -5 & 3 \\ -5 & 0 & 5 \\ 3 & 0 & 2 \end{pmatrix} + \begin{pmatrix} -5 & 8 & 0 \\ 2 & 6 & 2 \\ 0 & -2 & 3 \end{pmatrix} = \begin{pmatrix} -3 & 3 & 3 \\ -3 & 6 & 7 \\ 3 & -2 & 5 \end{pmatrix}$

ANSWER

Q1 VIII) $AB+D \quad 3 \times 3 + 2 \times 2$

$$\boxed{\text{NOT SAME}}$$

Q1 B)

$$\begin{array}{ccc} 2 & 2x-2 \\ 5 & x & 1 \\ 2 & (x+2) & 1 \end{array}$$

$$2(x - x \cdot 2) - 2x(5-2) - 2(5x+10 - 2x)$$

$$2x - 2x - 4 - 10x + 4x - 6x - 20$$

$$-12x - 24 \quad y/5 = -12x - 24$$

$$12x + 19 = 0$$

← ANSWER

$$x = -1582$$

Question Two

$$i) 2+5j + -5-2j = -3+3j$$

$$ii) 2+5j - -5-2j = 7+7j$$

$$iii) \frac{2+5j}{1-3j} \times \frac{1+3j}{1+3j}$$

$$2+6j+5j+15j^2 = 2+11j-15 \quad (j^2 = -1)$$

$$1+3j-3j-9j^2 = 1+9$$

$$\frac{-13+11j}{10} \quad \frac{10}{10}$$

$$1.3 + 1.1j$$

$$iv) (-5-2j)(-5-2j)$$

$$25+10j+10j+4j^2(-4)$$

$$(21+20j)-(2-5j)$$

$$19+25j$$

B

$$5x^2 = -3x - 12$$

$$\underset{A}{5x^2} + \underset{B}{3x} + \underset{C}{12} = 0$$

$$x = \frac{-3 \pm \sqrt{9-240}}{10}$$

$$x = \frac{-3 \pm \sqrt{+231}\sqrt{-1}}{10}$$

$$x = \frac{-3 \pm 15.2j}{10}$$

$$x = \frac{-3}{10} + \frac{15.2j}{10}$$

$$x = -0.3 + 1.52j$$

$$x = -0.3 - 1.52j$$

continued

P5

Q1 c)
$$\begin{pmatrix} 3 & -1 & 4 \\ 5 & 3 & -1 \\ 2 & 4 & 3 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 21 \\ 15 \\ 10 \end{pmatrix}$$

$$|A| = 3(9+4) - 1(-2-15) + 4(20-6) \quad |A| = 112$$

39 +17 +56

$$A_1 \begin{pmatrix} 21 & -1 & 4 \\ 15 & 3 & -1 \\ 10 & 4 & 3 \end{pmatrix} \quad 21(9+4) - 1(45+10) + 4(60-30)$$

273 -55 +120 $|A_1| = 338$

$$A_2 \begin{pmatrix} 3 & 21 & 4 \\ 5 & 15 & -1 \\ 2 & 10 & 3 \end{pmatrix} \quad 3(45+10) - 21(15+2) + 4(50-30)$$

165 -357 +80 $|A_2| = -112$

$$A_3 \begin{pmatrix} 3 & -1 & 21 \\ 5 & 3 & 15 \\ 2 & 4 & 10 \end{pmatrix} \quad 3(30-60) - 1(50-30) + 21(20-6)$$

-90 -20 +294 $|A_3| = 184$

$$x = \frac{338}{112} = 3 \quad y = \frac{-112}{112} = -1 \quad z = \frac{184}{112} = 1.64$$

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Q1) AB 3×3 3×3

$$\begin{array}{ccc} 2 & -5 & 3 \\ -5 & 0 & 5 \\ 3 & 0 & 2 \end{array} \quad \begin{array}{ccc} -5 & 8 & 0 \\ 2 & 6 & 2 \\ 0 & -2 & 3 \end{array}$$

$$\begin{pmatrix} -20 & -20 & -1 \\ 25 & -50 & 5 \\ -15 & 20 & 4 \end{pmatrix}$$

↑ ANSWER

$2 \times -5 + -5 \times 2 + 3 \times 0 = -20$

$2 \times 8 + -5 \times 6 + 3 \times -2 = -20$

$2 \times 0 + -5 \times 2 + 3 \times 3 = -1$

$-5 \times -5 + 0 \times 2 + 5 \times 0 = 25$

$-5 \times 8 + 0 \times 6 + 5 \times -2 = -50$

$-5 \times 0 + -5 \times 2 + 5 \times 3 = 5$

$3 \times -5 + 0 \times 2 + 2 \times 0 = -15$

$3 \times 8 + 0 \times 6 + 2 \times -2 = 20$

$3 \times 0 + -5 \times 2 + 2 \times 3 = -4$

Q1 ii) BA 3×3 3×3

$$\begin{array}{ccc} -5 & 8 & 0 \\ 2 & 6 & 2 \\ 0 & -2 & 3 \end{array} \quad \begin{array}{ccc} 2 & -5 & 3 \\ -5 & 0 & 5 \\ 3 & 0 & 2 \end{array}$$

$$\begin{pmatrix} 15 & 25 & 25 \\ 10 & -10 & 40 \\ 9 & 0 & -4 \end{pmatrix}$$

ANSWER ←

$-5 \times 2 + -5 \times -5 + 0 \times 3 = 15$

$-5 \times -5 + 8 \times 0 + 0 \times 0 = 25$

$-5 \times 3 + 8 \times 5 + 0 \times 2 = 25$

$2 \times 2 + 0 \times -5 + 2 \times 3 = 10$

$2 \times -5 + 6 \times 0 + 2 \times 0 = -10$

$2 \times 3 + 6 \times 5 + 2 \times 2 = 40$

$0 \times 2 + 0 \times -5 + 3 \times 3 = 9$

$0 \times -5 + -2 \times 0 + 3 \times 0 = 0$

$0 \times 3 + -2 \times 5 + 3 \times 2 = -4$

Q1 iii) 3×3 3×2

$$\begin{array}{ccc} 2 & -5 & 3 \\ -5 & 0 & 5 \\ 3 & 0 & 2 \end{array} \quad \begin{array}{cc} 12 & 5 \\ -3 & 2 \\ 2 & 5 \end{array}$$

$$\begin{pmatrix} 45 & 15 \\ 50 & 0 \\ 40 & 25 \end{pmatrix}$$

← ANSWER

$$\begin{array}{l} 2 \times 12 + -5 \times -3 + 3 \times 2 \\ -5 \times 12 + 0 \times -3 + 5 \times 2 \\ 3 \times 12 + 0 \times -3 + 2 \times 2 \end{array}$$

$$\begin{array}{l} 2 \times 5 + -5 \times 2 + 3 \times 5 \\ -5 \times 5 + 0 \times 2 + 5 \times 5 \\ 3 \times 5 + 0 \times 2 + 2 \times 5 \end{array}$$

Q1 iv) CA 3×2 3×3

NOT Same ← ANSWER

Question Three

$$(b) \int x \sin 4x \, dx$$

$$U \quad x$$

$$V \quad -\frac{1}{4} \cos 4x$$

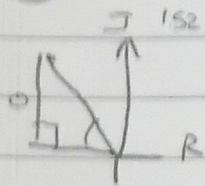
$$\frac{dU}{dx} \quad 1$$

$$\frac{dV}{dx} \quad \sin 4x$$

$$x \cdot -\frac{1}{4} (\cos 4x) - \int \frac{1}{4} \cos 4x \, dx$$
$$+ \frac{1}{4} \int \cos 4x \, dx$$

$$\boxed{-\frac{x}{4} \cos 4x + \frac{1}{4} \left(\frac{1}{4} \sin 4x \right) + C}$$

(B) $-0.3 + 1.52j$



$$R = \sqrt{0.3^2 + 1.52^2} (0.09 + 2.3104)$$

$$R = 1.55$$

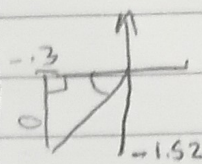
$$\theta = \tan^{-1} \frac{1.52}{0.3} = 78.8^\circ (180 - 78.8)$$

$$\theta = 101.2^\circ$$

$$1.55 (\cos 101.2 + j \sin 101.2)$$

POLAR FORM

$$-0.3 - 1.52j$$



$$R = 1.55$$

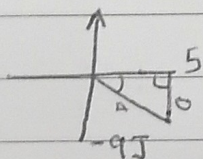
$$\theta = \tan^{-1} \frac{1.52}{0.3} = 78.8^\circ + 180^\circ$$

$$\theta = 258.8^\circ$$

$$1.55 (\cos 258.8 + j \sin 258.8)$$

POLAR FORM

(C) $(5 - 9j)^5$



$$\theta = \tan^{-1} \frac{9}{5} = 60.95^\circ$$

$$360 - 60.95 = 299.05^\circ$$

$$R = \sqrt{5^2 + 9^2}$$

$$R = 10.3$$

$$10.3^5 (\cos 5(299.05) + j \sin 5(299.05))$$

$$299.05 \times 5 = 1495.25^\circ$$

$$115,927 \times 0.57 + 115,927 \times 0.822j$$

$$66,078.4 + 95,292j$$

D) j^7

E) $\bar{g}$ is the conjugate (signs are changed)