

ai) ~~AB~~ AB

$$\begin{pmatrix} 13 & 33 & 12 \\ -6 & 22 & 26 \\ -8 & -10 & 1 \end{pmatrix}$$

$$\text{a ii)} \begin{pmatrix} 6 & 30 \\ -1 & 52 \\ -3 & 0 \end{pmatrix}$$

$$\text{a iii)} \begin{pmatrix} 8 & 6 & 3 \\ 0 & 6 & 6 \\ -2 & 5 & 2 \end{pmatrix}$$

a iv) Cannot Calculate.

a v) Cannot Calculate.

$$\text{a vi)} \begin{pmatrix} 18 & 20 \\ 4 & 30 \end{pmatrix}$$

$$\text{b)} \quad \begin{aligned} 3x + 2y + z &= 15 \\ x - y + 4z &= -2 \\ 2x + 5y + 2z &= 16 \end{aligned} \quad \begin{pmatrix} 3 & 2 & 1 \\ 1 & -1 & 4 \\ 2 & 5 & 2 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 15 \\ -2 \\ 16 \end{pmatrix}$$

$$|A| = -47$$

$$A_1 = \begin{pmatrix} 15 & 2 & 1 \\ -2 & -1 & 4 \\ 16 & 5 & 2 \end{pmatrix} = -188$$

$$A_2 = \begin{pmatrix} 3 & 15 & 1 \\ 1 & -2 & 4 \\ 2 & 16 & 2 \end{pmatrix} = -94$$

$$A_3 = \begin{pmatrix} 3 & 2 & 15 \\ 1 & -1 & -2 \\ 2 & 5 & 16 \end{pmatrix} = 47$$

$$x = \frac{-188}{-47} = 4$$

$$y = \frac{-94}{-47} = 2$$

$$z = \frac{47}{-47} = -1$$

C = the determinant.

Complex numbers

$$Z_1 = 2 + 5j, Z_2 = 1 - 8j, Z_3 = -3 + 2j$$

i $Z_1 + Z_2$

$$2 + 5j + 1 - 8j$$

$$= 3 - 3j$$

ii $Z_1 - Z_3$

$$(2 + 5j) - (-3 + 2j)$$

$$2 + 5j + 3 - 2j$$

~~$$5j + 3j$$~~
$$= 5 + 3j$$

ii $\frac{Z_1}{Z_2}$

~~$$\frac{(2 + 5j)}{(1 - 8j)} \times \frac{(1 + 8j)}{(1 + 8j)}$$~~

~~$$= \frac{(2 + 5j)(1 + 8j)}{(1 - 8j)(1 + 8j)}$$~~

$$\frac{(2 + 5j)}{(1 - 8j)} \times \frac{(1 + 8j)}{(1 + 8j)} = \frac{2 + 16j + 5j + 40j^2}{1 + 8j - 8j - 64j^2}$$

$$= \frac{-38 + 21j}{65} = \frac{-38}{65} + \frac{21}{65}j$$

$$b) \quad 12x^2 + 2x = -19$$

$$12x^2 + 2x + 19 = 0$$

$$x = \frac{-2 \pm \sqrt{2^2 - 4(12)(19)}}{2(12)}$$

$$x = \frac{-2 \pm \sqrt{4 - 912}}{24}$$

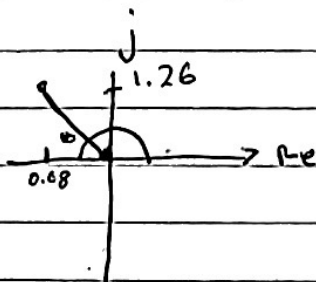
$$x = \frac{-2 \pm \sqrt{-908}}{24}$$

~~$$x = \frac{-2 \pm 30.13j}{24}$$~~

$$x = \frac{-2 \pm 30.13j}{24}$$

$$1 = -0.08 + 1.26j$$

$$2 = -0.08 - 1.26j$$



$$r^2 = 0.08^2 + 1.26^2$$

$$= 0.064 + 1.59$$

$$r = \sqrt{1.65}$$

$$r = 1.29$$

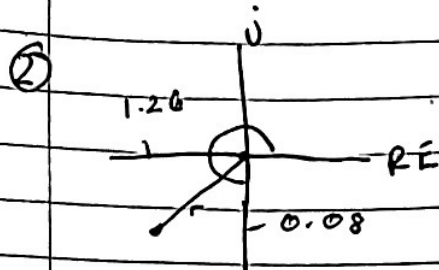
$$\tan \theta = \frac{1.26}{0.08}$$

~~$$\theta = 86.4^\circ$$~~

$$\theta = 93.6^\circ$$

$$PF = 1.29(\cos 93.6 + j \sin 93.6)$$

p.t.o



$$r = 1.29$$

$$\tan \theta = \frac{1.26}{0.08}$$

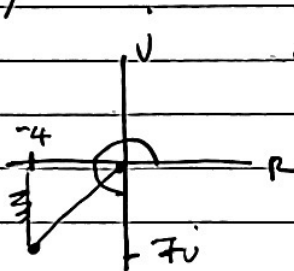
$$\theta = 86.4^\circ$$

$$\theta = 180 + 86.4$$

$$\theta = 266.4$$

$$PF = 1.29(\cos 266.4 + j \sin 266.4)$$

c) $(-4 - 7j)^6$



$$r^2 = 4^2 + 7^2$$

$$R = \sqrt{65}$$

$$R = 8.06$$

$$\tan \theta = \frac{7}{4}$$

$$\theta = 60.3^\circ$$

$$\theta = 180 + 60.3$$

$$\theta = 240.3^\circ$$

$$PF = 8.06(\cos 240.3 + j \sin 240.3)$$

$$DMT = (8.06)^6 (\cos 6 \times 240.3 + j \sin 6 \times 240.3)$$

$$274163.89 (\cos 1441.8 + j \sin 1441.8)$$

$$274028.61 + 8611.70j$$

(3)

$$i) \int 5x^3 - 2x^2 + 4x - 1 \, dx$$

$$= \frac{5x^4}{4} - \frac{2x^3}{3} + \frac{4x^2}{2} - x + C$$

$$ii) \int (x+2)(x+5)(x-1) \, dx$$

$$\int x^2 + 5x + 2x + 10 \, dx$$

$$\int (x^2 + 7x + 10)(x-1) \, dx$$

$$\int \{x^3 - x^2 + 7x^2 - 7x + 10x - 10\} \, dx$$

$$\int x^3 + 6x^2 + 3x - 10 \, dx$$

$$= \frac{x^4}{4} + \frac{6x^3}{3} + \frac{3x^2}{2} - 10x + C$$

$$iii) \int 3 \cos 2x - \frac{1}{5x} \, dx$$

$$3x \int \frac{1}{2} \sin 2x - \frac{1}{5x} \, dx$$

$$= 1.5 \sin 2x \ln x + C$$

P.T.O

$$\text{iv } \int_3^6 (5x+2)(2x+3) dx$$

$$\int_3^6 10x^2 + 15x + 4x + 6 dx$$

$$\int_3^6 10x^2 + 19x + 6 dx$$

$$= \frac{10x^3}{3} + \frac{19x^2}{2} + 6x$$

$$\left[\frac{10x^3}{3} + \frac{19x^2}{2} + 6x \right]_3^6$$

$$\left[\frac{10(6)^3}{3} + \frac{19(6)^2}{2} + 6(6) \right] - \left[\frac{10(3)^3}{3} + \frac{19(3)^2}{2} + 6(3) \right]$$

$$= \left[\frac{2160}{3} + \frac{684}{2} + 36 \right] - \left[\frac{270}{3} + \frac{171}{2} + 18 \right]$$

$$= [720 + 342 + 36] - [90 + 85.5 + 18]$$

$$= 1098 - 193.5$$

$$= \boxed{904.5}$$

$$a) \int_0^1 (3x+1)^2 + 2e^{3x} dx$$

$$\int (3x+1)(3x+1) + 2e^{3x}$$

$$\int 9x^2 + 3x + 3x + 1 + 2e^{3x}$$

$$\int 9x^2 + 6x + 1 + 2e^{3x}$$

$$= \frac{9x^3}{3} + \frac{6x^2}{2} + x + 2 \times \frac{1}{3} e^{3x}$$

$$b) \int \underset{u}{3x} \sin \underset{\frac{dv}{dx}}{4x} dx$$

$$uv - \int v \frac{du}{dx} dx$$

$$u = 3x \quad v = -\frac{1}{4} \cos 4x$$

$$\frac{du}{dx} = 3 \quad \frac{dv}{dx} = \sin 4x$$

$$3x \left(-\frac{1}{4} \cos 4x\right) - \int -\frac{1}{4} \cos 4x \cdot 3 dx$$

$$\boxed{-\frac{3}{4} \cos 4x + \frac{3}{4} \sin 4x + C}$$

$$\text{ii)} \int 2x e^{3x} dx$$

$\uparrow$ $\uparrow$
 u $\frac{dv}{dx}$

$$u = 2x \quad v = \frac{1}{3} e^{3x}$$

$$\frac{du}{dx} = 2 \quad \frac{dv}{dx} = e^{3x}$$

$$= 2x \left(\frac{1}{3} e^{3x} \right) - \int \left(\frac{1}{3} e^{3x} \right) (2)$$

$$= 2x \left(\frac{1}{3} e^{3x} \right) - 2x \int \frac{1}{3} e^{3x}$$

$$= \frac{2x}{3} e^{3x} - 0.66 e^{3x}$$