

a):

$$Q1. i) AB \begin{pmatrix} 13 & 33 & 12 \\ -6 & 22 & 26 \\ -8 & -10 & 1 \end{pmatrix}$$

3×3

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

3×2

iii)

$$A+B \begin{pmatrix} 8 & 6 & 3 \\ 0 & 6 & 6 \\ -2 & 5 & 2 \end{pmatrix}$$

iv)

$$A+D - \text{cannot be calculated.}$$

v)

$$BD - \text{cannot be calculated}$$

vi)

$$2D = \begin{pmatrix} 18 & 20 \\ 4 & 30 \end{pmatrix}$$

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

$$[A1] = \begin{pmatrix} 15 & 2 & 1 \\ -2 & -1 & 4 \\ 16 & 5 & 2 \end{pmatrix} = 188 \quad [A2] = \begin{pmatrix} 3 & 15 & 1 \\ 1 & -2 & 4 \\ 2 & 16 & 2 \end{pmatrix} = 94 \quad [A3] = \begin{pmatrix} 3 & 2 & 15 \\ 1 & -1 & -2 \\ 2 & 5 & 16 \end{pmatrix} = 47$$

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

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

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

c) The Determinant

$$Q2) \quad z_1 = 2+5j \quad z_2 = 1-8j \quad z_3 = -3+2j$$

$$(i) \quad z_1 + z_2$$

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

$$\boxed{3 - 3j}$$

$$(ii) \quad z_1 - z_3$$

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

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

$$\boxed{5+3j}$$

$$(iii) \quad \frac{z_1}{z_2}$$

$$\frac{2+5j}{1-8j}$$

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

$$\frac{2+16j+5j+40j^2}{1+8j-8j-64j^2} = \frac{2+21j+40j^2}{1-64j^2}$$

$$\frac{2+21j-40}{65}$$

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

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

$$\boxed{-0.58 + 0.32j}$$

$$b) 12x^2 + 2x = -19 \Rightarrow 0 = 12x^2 + 2x + 19$$

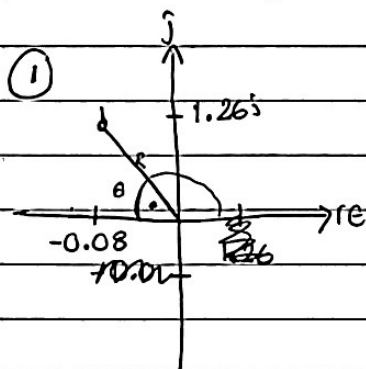
$\begin{matrix} a & b & c \end{matrix}$

$$x = \frac{-2 \pm \sqrt{2^2 - 4(12)(19)}}{2(12)} = \frac{-2 \pm \sqrt{4 - 912}}{24}$$

$$x = \frac{-2 \pm \sqrt{-908} \sqrt{-1}}{24} = \frac{-2 \pm \sqrt{908}j}{24}$$

$$= x = \frac{-2 \pm \sqrt{908}j}{24} \quad \textcircled{1} x = -0.08 + 1.26j$$

$$\textcircled{2} x = -0.08 - 1.26j$$



$$r^2 = 0.08^2 + 1.26^2 = 0.064 + 1.59$$

$$r = \sqrt{1.65}$$

$$r = 1.29$$

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

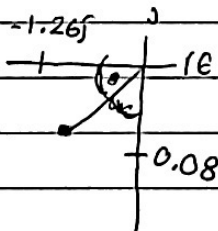
$$= 86.4^\circ$$

$$\theta = 180 - 86.4$$

$$\theta = 93.6^\circ$$

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

②



$$r = 1.29$$

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

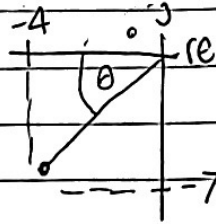
$$= 86.4^\circ$$

$$= 180 + 86.4$$

$$= 266.4^\circ$$

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

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



$$r^2 = 4^2 + 7^2 = 65$$

$$r = \sqrt{65}$$

$$r = 8.06$$

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

$$\theta = 60.3^\circ$$

$$\theta = 180 + 60.3$$

$$\theta = 240.3^\circ$$

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

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

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

$$[274028.61 + 8611.70j]$$

Q3) (i) $\int 5x^3 - 2x^2 + 4x - 1 \, dx$

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

(ii) $\int (x+2)(x+5)(x-1) \, dx$ $\int (x^2+5x+2x+10)(x-1) \, dx$

$$\int (x^2+7x+10)(x-1) \, dx \quad \int x^3 - x^2 + 7x^2 - 7x + 10x - 10 \, dx$$

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

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

$$= 3 \times \frac{1}{2} \sin 2x - \frac{1}{x} \, dx$$

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

$$\int_3^6 (5x+2)(2x+3) dx \quad \int_3^6 10x^2 + 15x + 4x + 6 dx$$

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

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

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

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

$$[1098] - [193.5]$$

$$= 904.5$$

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

$$\int_0^3 9x^2 + 3x + 3x + 1 + 2e^{3x} dx \quad \int_0^3 9x^2 + 6x + 1 + 2e^{3x} dx$$

$$= \frac{9x^3}{3} + \frac{6x^2}{2} + 4x + 2 \times \frac{1}{3} e^{3x}$$

$$= \left[\frac{9(3)^3}{3} + \frac{6(3)^2}{2} + 3 + 0.66e^{3(3)} \right] - \left[0 \right]$$

$$= [81 + 27 + 3 + 0.66e^9] - 0$$

$$= 111.01e^9$$

$$b) (i) \int \underset{\substack{\uparrow \\ u}}{3x} \underset{\substack{\uparrow \\ \frac{dv}{dx}}}{\sin 4x} dx \quad u = 3x$$

$$\frac{dv}{dx} = \sin 4x$$

$$uv - \int v \frac{du}{dx} dx \quad \frac{du}{dx} = 3$$

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

$$-\frac{3}{4} \cos 4x + \int \frac{3}{4} \cos 4x dx$$

$$-\frac{3}{4} \cos 4x = \frac{3}{4} \times \frac{1}{4} \sin 4x dx$$

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

$$(ii) \int \underset{\substack{\uparrow \\ u}}{2x} \underset{\substack{\uparrow \\ \frac{dv}{dx}}}{e^{3x}} dx$$

$$u = 2x$$

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

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

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

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

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