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① a) i)

$$AB = \begin{array}{|c|c|c|} \hline 1+0+0 & 2+0+14 & 3+0+4 \\ \hline 2+0-32+0 & 4+8+49 & 6+0+14 \\ \hline -7-8+0 & -14+2+0 & -21+0+0 \\ \hline \end{array}$$

$$AB = \begin{pmatrix} 1 & 16 & 7 \\ -30 & 61 & 20 \\ -15 & -12 & -21 \end{pmatrix}$$

$$ii) AC = \begin{array}{|c|c|} \hline 7+0+4 & 1+0+14 \\ \hline 14+24+14 & 2+64+49 \\ \hline -49+6+0 & -7+16+0 \\ \hline \end{array}$$

$$AC = \begin{pmatrix} 11 & 15 \\ 52 & 115 \\ -43 & 9 \end{pmatrix}$$

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$$A+B = \begin{pmatrix} 2 & 2 & 5 \\ -2 & 9 & 7 \\ -7 & 9 & 2 \end{pmatrix}$$

iv) Cannot Calculate

v) Cannot Calculate

vi)

$$2D = \begin{pmatrix} 4 & 24 \\ 4 & 10 \end{pmatrix}$$

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$$5x + y + 2z = 32$$

$$x - y + z = 10$$

$$2x + 5y + 2z = 13$$

$$\begin{pmatrix} 5 & 1 & 2 \\ 1 & -1 & 1 \\ 2 & 5 & 2 \end{pmatrix} = \begin{pmatrix} 32 \\ 10 \\ 13 \end{pmatrix}$$

$$|A| = 5((-1 \times 2) - 5 \times 1) - 1(1 \times 2 - 2 \times 1) + 2(1 \times 5 - (2 \times -1))$$

$$|A| = -35 - 0 + 14$$

$$|A| = -21$$

$$|A_1| = \begin{pmatrix} 32 & 1 & 2 \\ 10 & -1 & 1 \\ 13 & 5 & 2 \end{pmatrix}$$

$$|A_1| = 32((-1 \times 2) - (5 \times 1)) - 1(10 \times 2 - 13 \times 1) + 2(10 \times 5 - (13 \times -1))$$

$$|A_1| = -224 - 7 + 126$$

6) Continued

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$$|A_2| = \begin{pmatrix} 5 & 32 & 2 \\ 1 & 10 & 1 \\ 2 & 13 & 2 \end{pmatrix}$$

$$|A_2| = 5(10 \times 2 - 13 \times 1) - 32(1 \times 2 - 2 \times 1) \\ + \cancel{2(10 \times 13 - 2 \times 10)} + 2(1 \times 13 - 2 \times 10)$$

$$|A_2| = 35 - 0 - 14$$

$$|A_2| = 21$$

$$|A_3| = \begin{pmatrix} 5 & 1 & 32 \\ 1 & -1 & 10 \\ 2 & 5 & 13 \end{pmatrix}$$

$$|A_3| = 5((-1 \times 13) - 5 \times 10) - 1(1 \times 13 - 2 \times 10) \\ + 32(1 \times 5 - (2 \times -1))$$

$$|A_3| = -315 + 7 + 224$$

$$|A_3| = -84$$

b) Continued

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$$x = \frac{-105}{-21}, y = \frac{21}{-21}, z = \frac{-84}{-21}$$

$$\underline{x = 5}, \underline{y = -1}, \underline{z = 4}$$

c) Determinant

② a) i)

$$z_1 + z_2 = \underline{3 + 2j}$$

$$\text{ii) } z_1 - z_3 = \underline{3 + 4j}$$

② a) iii)

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$$\frac{Z_1}{Z_2} = \frac{1+7j}{2-5j} \times \frac{2+5j}{2+5j}$$

$$\begin{array}{r|rr} & 1 & 7j \\ \hline 2 & 2 & 14j \\ \hline -5j & -5j & -35j^2 \end{array}$$

$$\begin{array}{r|rr} & 2 & -5j \\ \hline 2 & 4 & -10j \\ \hline 5j & 10j & -25j^2 \end{array}$$

$$\frac{-35j^2 + 9j + 2}{-25j^2 + 4}$$

$$\textcircled{j^2 = -1}$$

$$\frac{9j + 2 + 35}{25 + 4}$$

$$\frac{9j + 37}{29}$$

$$= \frac{37}{29} + \frac{9j}{29}$$

②6)

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$$11x^2 + 3x + 17 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-3 \pm \sqrt{3^2 - 4 \times 11 \times 17}}{2 \times 11}$$

$$x = \frac{-3 \pm \sqrt{-739}}{22}$$

$$x = \frac{-3 + 27.2j}{22} = -0.14 + 1.24j$$

$$x = \frac{-3 - 27.2j}{22} = -0.14 - 1.24j$$

(2) 6) Continued

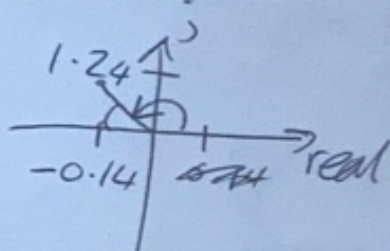
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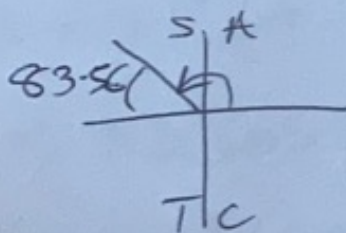
$$\frac{-0.14 + 1.24j}{}$$

$$r = \sqrt{0.14^2 + 1.24^2}$$

$$r = 1.25$$



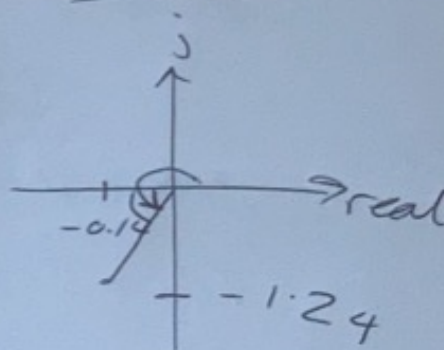
$$\theta = \tan^{-1}\left(\frac{1.24}{-0.14}\right)$$
$$\theta = -83.56^\circ$$



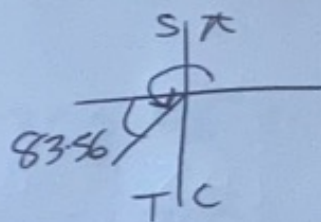
$$\theta = 96.44^\circ$$

$$\frac{-0.14 - 1.24j}{}$$

$$r = 1.25$$



$$\theta = \tan^{-1}\left(\frac{-1.24}{-0.14}\right)$$
$$\theta = 83.56^\circ$$



$$\theta = 263.56^\circ$$

$$1.25(\cos 96.44^\circ + j \sin 96.44^\circ)$$

$$1.25(\cos 263.56^\circ + j \sin 263.56^\circ)$$

② C) i)

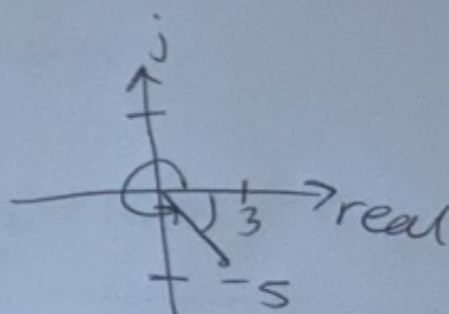
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$$(3 - 5j)^5$$

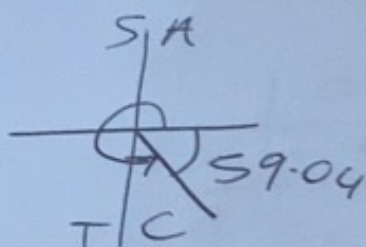
$$r = \sqrt{3^2 + 5^2}$$

$$r = 5.83$$



$$\theta = \tan^{-1}\left(\frac{-5}{3}\right)$$

$$\theta = -59.04^\circ$$



$$\theta = 300.96^\circ$$

$$(5.83)^5$$

$$5.83(\cos 300.96^\circ + j \sin 300.96^\circ)$$

$$(5.83)^5 (\cos 5 \times 300.96^\circ + j \sin 5 \times 300.96^\circ)$$

$$6735.08 (0.42578 + j 0.9048)$$

$$2867.66 + 6093.9j$$

③ a)

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$$i) \int 3x^3 - 5x^2 + 3x - 10 dx$$

$$= \frac{3x^4}{4} - \frac{5x^3}{3} + \frac{3x^2}{2} - 10x + C$$

$$ii) \int (x+5)(x+3)(x-2) dx$$

	x	3
x	x^2	$3x$
5	$5x$	15

$$\int (x^2 + 8x + 15)(x-2) dx$$

$$\int (x^3 + 8x^2 + 15x - 2x^2 - 16x - 30) dx$$

$$\int x^3 + 6x^2 - x - 30 dx$$

$$= \frac{x^4}{4} + 2x^3 - \frac{x^2}{2} - 30x + C$$

③ iii)

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$$\int 5 \sin 3x + \frac{1}{x} dx \quad \begin{array}{l} \frac{1}{x} = x^{-1} \\ = \ln x \end{array}$$

$$= -\frac{5}{3} \cos 3x + \ln x + C$$

iv) $\int_2^5 (3x+1)(6x+2) dx$

	$3x$	1
$6x$	$18x^2$	$6x$
2	$6x$	2

$$\int_2^5 18x^2 + 12x + 2 dx$$

$$= \int_2^5 [6x^3 + 6x^2 + 2x] + C$$

$$= \left[6 \times 5^3 + 6 \times 5^2 + 2 \times 5 \right] - \left[6 \times 2^3 + 6 \times 2^2 + 2 \times 2 \right]$$

$$= [750 + 150 + 10] - [48 + 24 + 4]$$

6) i)

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$$\int 2x \sin 3x dx$$

$$u = 2x$$

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

$$\frac{du}{dx} = 2$$

$$\frac{dv}{dx} = \sin 3x$$

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

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

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

$$= 2x \left(-\frac{1}{3} \cos 3x \right) + \frac{2}{3} \times \left(\frac{1}{3} \sin 3x \right) + C$$

$$= 2x \left(-\frac{1}{3} \cos 3x \right) + \frac{2}{9} \sin 3x + C$$
