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Question one:

(A) $\oplus A \cdot B \Rightarrow (3 \times 3) \cdot (3 \times 3)$

$B = \begin{pmatrix} -2 & 8 & 0,5 \\ 2 & 5 & 2 \\ 0 & -9 & 1 \end{pmatrix}$ possible.

$A = \begin{pmatrix} 8 & -1 & 7 \\ -5 & 2 & 5 \\ 3 & 0 & 2 \end{pmatrix} \begin{pmatrix} (-16-2+0)(64-5-63)(4-2+7) \\ (10+4+0)(-40+10-45)(-3,5+2+5) \\ (-6+0+0)(24+0-18)(1,5+0+2) \end{pmatrix} \Rightarrow A \cdot B = \begin{pmatrix} -18 & -4 & 9 \\ -14 & -75 & 4,5 \\ -6 & 6 & 3,5 \end{pmatrix}$

(II) $\oplus B \cdot A \Rightarrow (3 \times 3) \cdot (3 \times 3)$

possible.

$A = \begin{pmatrix} 8 & -1 & 7 \\ -5 & 2 & 5 \\ 3 & 0 & 2 \end{pmatrix}$

$B = \begin{pmatrix} -2 & 8 & 0,5 \\ 2 & 5 & 2 \\ 0 & -9 & 1 \end{pmatrix} \begin{pmatrix} (-16-40+9,5)(2+16+0)(-14+40+1) \\ (16-25+6)(-2+10+0)(14+25+4) \\ (0+45+13)(0-18+0)(0-45+2) \end{pmatrix}$

$\Rightarrow B \cdot A = \begin{pmatrix} -54,5 \\ -54,5 \\ -54,5 \end{pmatrix}$

$B \cdot A = \begin{pmatrix} -54,5 & 18 & 24 \\ -3 & 8 & 43 \\ 48 & -18 & -43 \end{pmatrix}$

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$\textcircled{A} \textcircled{II}$ $A \cdot C \Rightarrow (3 \times 3) \cdot (3 \times 2)$
 $\textcircled{A}$ $\textcircled{C}$
 is compatible.

$$C = \begin{pmatrix} 2 & 5 \\ -6 & 0 \\ 1 & 12 \end{pmatrix}$$

$$A = \begin{pmatrix} 8 & -1 & 7 \\ -5 & 2 & 5 \\ 3 & 0 & 2 \end{pmatrix} \begin{pmatrix} (16+6+7) & (40+0+84) \\ (-10-12+5) & (-25+0+60) \\ (6+0+2) & (15+0+24) \end{pmatrix} \Rightarrow A \cdot C = \begin{pmatrix} 29 & 124 \\ -17 & 35 \\ 8 & 39 \end{pmatrix}$$

$\textcircled{IV}$

$$(0 \cdot A) \Rightarrow (3 \times 2) \cdot (3 \times 3)$$

$\textcircled{C}$ $\textcircled{A}$
 is not mathematically possible.

$$\textcircled{V} \quad |A| = 2 \cdot \begin{vmatrix} 2 & 5 \\ 0 & 2 \end{vmatrix} - (-1) \cdot \begin{vmatrix} -5 & 5 \\ 3 & 2 \end{vmatrix} + 7 \cdot \begin{vmatrix} -5 & 2 \\ 3 & 0 \end{vmatrix}$$

$$= 8 \cdot (4-0) + 1 \cdot (-10-15) + 7 \cdot (0-6)$$

$$= 32 - 25 - 42$$

$$|A| = -35$$

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(A) VI

$$\begin{aligned}
 |B| &= -2 \cdot \begin{vmatrix} 6 & 2 \\ -3 & 1 \end{vmatrix} - 8 \cdot \begin{vmatrix} 2 & 2 \\ 0 & 1 \end{vmatrix} + 0,5 \cdot \begin{vmatrix} 2 & 5 \\ 0 & -3 \end{vmatrix} \\
 &= -2(5 + 18) - 8 \cdot 2 + 0,5(-18) \\
 &= -46 - 16 + (-9) \\
 &= -71
 \end{aligned}$$

(VII)

$$A + B = \begin{bmatrix} 8 & -1 & 7 \\ -5 & 2 & 5 \\ 3 & 0 & 2 \end{bmatrix} + \begin{bmatrix} -2 & 8 & 9,5 \\ 2 & 5 & 2 \\ 0 & -9 & 1 \end{bmatrix} = \begin{bmatrix} 6 & 7 & 7,5 \\ -3 & 7 & 7 \\ 3 & -9 & 3 \end{bmatrix}$$

(VIII)

$$A \cdot B + D = \begin{bmatrix} -18 & -4 & 9 \\ 14 & -75 & 4,5 \\ -6 & 6 & 3,5 \end{bmatrix} + \begin{bmatrix} 8 & -14 \\ 0,25 & 2,1 \end{bmatrix}$$

not possible.

 $[3 \times 3] + [2 \times 2]$ can't possible.

Question one, B

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$$\begin{bmatrix} 15x^2 + 4x - 17 & 1 & 11 \\ 2 & 0 & -2 \\ 2 & -2 & x^4 \end{bmatrix} = \begin{bmatrix} 4 & 1 & 11 \\ 2 & 5 & -2 \\ 2 & -2 & 4^2 \end{bmatrix}$$

$$15x^2 + 4x - 17 = 4$$

$$4^2 = x^4$$

$$\Rightarrow \begin{cases} 15x^2 + 4x - 17 = 4 \\ 4 = \sqrt{x^4} = x^2 \end{cases}$$

$$\begin{cases} 15x^2 + 4x - 17 - x^2 = 0 \\ 4 = x^2 \end{cases}$$

$$\begin{cases} 14x^2 + 4x - 17 = 0 \\ 4 = x^2 \end{cases}$$

$$\left(\begin{aligned} 0^2 - 400 &= -16 - 4 \cdot 17 = -72 \\ &= -16 + 68 \\ &= 52 \end{aligned} \right)$$

$$x = \frac{-6 \pm \sqrt{984}}{28}$$

$$\begin{cases} x = 0,98 & , & x = -1,26 \\ 4 = x^2 \end{cases}$$

$$\begin{cases} x_1 = 0,98 & , & x_2 = -1,26 \\ y_1 = 0,9604 & , & y_2 = 1,5876 \end{cases}$$

$$x = \frac{200}{-4 + 31,37} = \frac{-4 - 31,37}{28} = \frac{28}{28}$$

solution: $x_1 = 0,98$

$$x_2 = -1,26$$

$$y_1 = 0,9604$$

$$y_2 = 1,5876$$

Question one, (c)

$$|w| = 2$$

$$|w| = 2 \cdot \begin{vmatrix} x & 0 \\ (x+1) & 3 \end{vmatrix} - (4x) \cdot \begin{vmatrix} 4 & 0 \\ 1 & 3 \end{vmatrix} + (-5) \cdot \begin{vmatrix} 4 & x \\ 1 & (x+1) \end{vmatrix}$$

$$= 2 \cdot (3x - 0) - 4x \cdot (12 - 0) - 5 \cdot (4x + 4 - x)$$

$$= 6x - 48x - 15x - 20$$

$$|w| = 6x - 57x - 20$$

$$2 = -57x - 20$$

$$22 = -57x$$

$$x = \frac{22}{-57} = -0,39$$

$$\boxed{\text{solution: } x = -0,39}$$

question one, (d)

$$2x + 3y + 2z = 14$$

$$x + 2y + 5z = 4$$

$$3x + y - 2z = 19$$

coefficient matrix.

$$\Rightarrow C = \begin{bmatrix} 2 & 3 & 2 \\ 1 & 2 & 5 \\ 3 & 1 & -2 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 14 \\ 4 \\ 19 \end{bmatrix}$$

$$|C| = 2 \cdot \begin{vmatrix} 2 & 5 \\ 1 & -2 \end{vmatrix} - 3 \cdot \begin{vmatrix} 1 & 5 \\ 3 & -2 \end{vmatrix} + 2 \cdot \begin{vmatrix} 1 & 2 \\ 3 & 1 \end{vmatrix}$$

$$= 23$$

$$C_1 = \begin{bmatrix} 14 & 3 & 2 \\ 4 & 2 & 5 \\ 19 & 1 & -2 \end{bmatrix} \Rightarrow |C_1| = 14 \cdot \begin{vmatrix} 2 & 5 \\ 1 & -2 \end{vmatrix} - 3 \cdot \begin{vmatrix} 4 & 5 \\ 19 & -2 \end{vmatrix} + \begin{vmatrix} 4 & 2 \\ 19 & 1 \end{vmatrix} = 115$$

$$C_2 = \begin{bmatrix} 2 & 14 & 2 \\ 3 & 4 & 5 \\ 3 & 9 & -2 \end{bmatrix} \Rightarrow |C_2| = 126$$

Question one, D

$$C_3 = \begin{bmatrix} 2 & 3 & 14 \\ 1 & 2 & 4 \\ 3 & 1 & 9 \end{bmatrix} \Rightarrow |C_3| = -33$$

$$X = \frac{|C_1|}{|C|} = \frac{115}{23} = 5$$

$$Y = \frac{|C_2|}{|C|} = \frac{126}{23} = 5,48$$

$$Z = \frac{|C_3|}{|C|} = \frac{-33}{23} = -1,43$$

$$\text{solution: } \begin{cases} X = 5 \\ Y = 5,48 \\ Z = -1,43 \end{cases}$$

Question 2, A

$$\begin{aligned} \text{(I)} \quad Z_1 + Z_3 &= (3+7j) + (-4-j) \\ &= 3-4 + 7j-j \\ &= \boxed{-1+6j} \end{aligned}$$

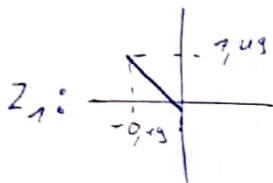
$$\begin{aligned} \text{(II)} \quad Z_1 - Z_3 &= (3+7j) - (-4-j) \\ &= 3+7j + 4+j \\ &= \boxed{7+8j} \end{aligned}$$

$$\begin{aligned} \text{(III)} \quad \frac{Z_1}{Z_2} &= \frac{3+7j}{2-10j} \times \frac{2+10j}{2+10j} = \frac{6+30j+14j+70j^2}{4+30j-20j+100j^2} \\ &= \frac{-70j^2+44j+6}{4+100j^2} = \frac{44j-64}{104} = \boxed{-0,62+42j} \end{aligned}$$

Question 2B

$$8x^2 + 3x + 18 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-3 \pm \sqrt{9 - 576}}{16} = \frac{-3 \pm 23,81}{16}$$



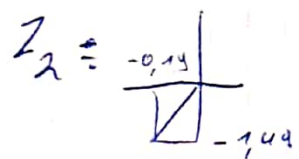
$$r = \sqrt{0,19^2 + 1,49^2} = 1,50$$

$$Z_1 = -0,19 + 1,49j$$

$$Z_2 = -0,19 - 1,49j$$

$$\theta = 180 - \tan^{-1}\left(\frac{1,49}{0,19}\right) = 97,26^\circ$$

$$Z_1 = 1,5 \cdot (\cos(97,26) + j \cdot \sin(97,26))$$



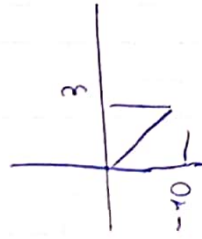
$$r = 1,5$$

$$\theta = 180 + \tan^{-1}\left(\frac{1,49}{0,19}\right) = 262,73^\circ$$

$$Z_2 = 1,5 \cdot (\cos(262,73) + j \cdot \sin(262,73))$$

Question 2, 1

1) $(3 - 10j)^6$



$$r = \sqrt{10^2 + 3^2}$$

$$= 10,44$$

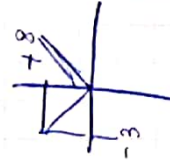
$$\theta = 360 - \cos^{-1}\left(\frac{10}{3}\right)$$

$$= 286,70^\circ$$

$$= (10,44)^6 \cdot \left(\cos(6 \cdot 286,70) + j \cdot \sin(6 \cdot 286,70) \right)$$

$$= 229\,289,54 - 1274337j$$

2) $(-3 + 8j)^5$



$$r = \sqrt{3^2 + 8^2}$$

$$= 8,54$$

$$\theta = 180 - \cos^{-1}\left(\frac{8}{3}\right)$$

$$= 110,55$$

$$= 8,54^5 \cdot \left(\cos(5 \cdot 110,55) + j \cdot \sin(5 \cdot 110,55) \right)$$

$$= -44304,35 - 10025j$$

Question 2 (d)

$$j^5 \times j^3 = \cancel{\sqrt{-1}} \cdot \cancel{\sqrt{-1}}$$

$$\begin{aligned} \hookrightarrow &= j^8 = (-1)^{\frac{8}{2}} \\ &= (-1)^4 \end{aligned}$$

$$\boxed{j^5 \times j^3 = 1}$$

Question 2 (e)

$\bar{x}$ is x his conjugate.

Question 2 (f)

$$\begin{aligned} \bar{z}_1 \cdot \bar{z}_2 \cdot \bar{z}_3 &= (9 - 4j) \cdot (-7 + 5j) \cdot (2 + 5j) \\ &= (-63 + 45j - 28j + 20j^2) \cdot (2 + 5j) \\ &= -126 + 40j - 56j + 40j^2 - 315 \end{aligned}$$