

1 CUR18839576

CUR1883

Exam 10/5/21

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Q1 Q1=[23/35]

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$$a) i = \begin{bmatrix} 2 & 0 & 3 \\ 1 & 8 & 3 \\ 0 & 2 & 0 \end{bmatrix} \quad D = 2(8 \times 0 - 3 \times 2) -$$

$$0(1 \times 0 - 3 \times 0) -$$

$$3(1 \times 2 - 8 \times 0)$$

$$-12 - 0 + 6 = -6 \quad [4/4]$$

ii = Unable to find due to not being square [1/1]

$$iii = \begin{bmatrix} 2 & 4 \\ -3 & 8 \end{bmatrix} = 2 \times 8 - 4 \times -3$$

$$= 16 + 12$$

$$= 28 \quad [2/2]$$

iv

Find AB

$$A = \begin{bmatrix} 2 & 0 & 3 \\ 1 & 8 & 3 \\ 0 & 2 & 0 \end{bmatrix} \quad B = \begin{bmatrix} 3 & 0 & 2 \\ 2 & 5 & 0 \\ 1 & 3 & 6 \end{bmatrix}$$

$$= 2 \times 3 + 0 \times 2 + 3 \times 1 = 9$$

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

$$= 2 \times 2 + 0 \times 0 + 3 \times 6 = 22$$

$$= 1 \times 3 + 8 \times 2 + 3 \times 1 = 22$$

$$= 1 \times 0 + 8 \times 5 + 3 \times 3 = 49$$

$$= 1 \times 2 + 8 \times 0 + 3 \times 6 = 20$$

$$= 0 \times 3 + 2 \times 2 + 0 \times 1 = 4$$

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

$$= 0 \times 2 + 2 \times 0 + 0 \times 6 = 0$$

$$\begin{bmatrix} 9 & 9 & 9 \\ 22 & 49 & 20 \\ 4 & 10 & 0 \end{bmatrix}$$

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v. Find BC $B = \begin{bmatrix} 3 & 0 & 2 \\ 2 & 5 & 0 \\ 1 & 3 & 6 \end{bmatrix}$ $C = \begin{bmatrix} 1 & 4 \\ 2 & -5 \\ 3 & 1 \end{bmatrix}$

$$\begin{aligned} &= 3 \times 1 + 0 \times 2 + 2 \times 3 = 9 \\ &= 3 \times 4 + 0 \times -5 + 2 \times 1 = 14 \\ &= 2 \times 1 + 5 \times 2 + 0 \times 3 = 12 \\ &= 2 \times 4 + 5 \times -5 + 0 \times 1 = -17 \\ &= 1 \times 1 + 3 \times 2 + 6 \times 3 = 25 \\ &= 1 \times 4 + 3 \times -5 + 6 \times 1 = -5 \end{aligned} \quad = \begin{bmatrix} 9 & 14 \\ 12 & -17 \\ 25 & -5 \end{bmatrix}$$

[4/4]

vi. Cannot be calculated due to conflicting sizes. [1/1]

vii. Cannot be calculated due to conflicting sizes. [1/1]

b) Find inverse of matrix

$$\begin{bmatrix} 2 & 4 & 1 \\ 1 & 4 & 7 \\ 0 & 5 & 2 \end{bmatrix} \begin{matrix} 0 & 35 & 0 \\ 16 & 140 & 0 \end{matrix} \quad \begin{aligned} A &= (16 + 35 + 0) \\ A &= (16 + 140 + 0) - (0 + 35 + 0) \\ &= 121 \end{aligned}$$

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[6/10]

$$N = \begin{bmatrix} \begin{bmatrix} 4 & 7 \\ 5 & 2 \end{bmatrix} & \begin{bmatrix} 1 & 7 \\ 0 & 2 \end{bmatrix} & \begin{bmatrix} 1 & 4 \\ 0 & 5 \end{bmatrix} \\ \begin{bmatrix} 4 & 1 \\ 5 & 2 \end{bmatrix} & \begin{bmatrix} 2 & 1 \\ 0 & 2 \end{bmatrix} & \begin{bmatrix} 2 & 4 \\ 0 & 5 \end{bmatrix} \\ \begin{bmatrix} 4 & 1 \\ 4 & 7 \end{bmatrix} & \begin{bmatrix} 2 & 1 \\ 1 & 7 \end{bmatrix} & \begin{bmatrix} 2 & 4 \\ 1 & 4 \end{bmatrix} \end{bmatrix} = \begin{bmatrix} +[8-35] - [2] + [5] \\ +[8-5] + [4] - [10] \\ +[28+4] - [14-1] + [8-4] \end{bmatrix}$$

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$$N = \begin{bmatrix} -27 & -2 & 5 \\ -3 & 4 & -10 \\ 24 & -13 & 4 \end{bmatrix}$$



$$c) \quad 3x - 2y + z = 2$$

$$x - 3y + 2z = 1$$

$$2x + y - 3z = -5$$



$$x = \begin{array}{r} 2 \\ 1 \\ -5 \end{array}$$

$$\begin{array}{r} 3 \ 2 \ 1 \\ 1 \ -3 \ 2 \\ 2 \ 1 \ -3 \end{array}$$

$$y = \begin{array}{r} 2 \\ 1 \\ -5 \end{array}$$

$$\begin{array}{r} 3 \ 2 \ 1 \\ 1 \ -3 \ 2 \\ 2 \ 1 \ 3 \end{array}$$

$$z = \begin{array}{r} 2 \\ 1 \\ -5 \end{array}$$

$$\begin{array}{r} 3 \ 2 \ 1 \\ 1 \ -3 \ 2 \\ 2 \ 1 \ 3 \end{array}$$

Question Two

Q2=[13/33]

$$a) \quad i. \quad 2 + 5j + 3 + 2j$$

$$= 5 + 7j \quad [1/1]$$

$$ii = 3(3 + 2j) + 2(4 + 3j)$$

$$= 9 + 6j + 8 + 6j$$

$$= 17 + 12j \quad [3/3]$$

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iii. $(2+5j)^2 + 3+2j$

$$(2+5j)(2+5j) \quad [1/4]$$

$$4+10j+10j+25j^2$$

$$7+22j+25 \times$$

iv. $(2+5j)(3+2j)$

$$6+4j+15j+10j^2$$

$$6+19j+10j^2 \quad [2/3]$$

v. $\frac{z_1}{z_2} = \frac{2+5j}{3+2j} = \frac{2+5j}{3+2j} \left(\frac{3-2j}{3-2j} \right)$

$$= \frac{6-4j+15j-10j^2}{9-4j^2}$$

$$= \frac{16+11j}{13} = \frac{16}{13} + \frac{11}{13}j \quad [4/5]$$

b) solve the following and express in polar form

$$5x^2 - 8x + 5 = 0$$

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

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$$= \frac{+8 \pm \sqrt{-8^2 - 4(5 \times 5)}}{2 \times 5} \quad [1/1]$$

$$= 8 + \sqrt{64 - 100}$$

c) use de Moivre's theorem to calculate $(3 + 4j)^4$, in rectangular form.

$$r = \sqrt{(3)^2 + (4)^2} = \sqrt{25} = 5 \quad [1/8]$$

$$z = 5 \angle (\cos 84^\circ + j \sin 86^\circ)$$

Question Three

a) i. $\int \frac{x(x^2 + 3x)}{x^2(x + 3)} dx$ Q3=[10/32]

$$x^2(x + 3)$$

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

$$\frac{x^{n+1}}{n+1} = \frac{x^4}{4}$$

$$\frac{x^4}{4} + x^3 + C \quad [4/4]$$

ii. $((x+2)(2x+1) - \sin 4x)$

$$\int (x+2)(2x+1) dx - \int \sin(4x) dx$$

$$\int (2x^2 + 5x + 2) dx$$

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Power rule to other side

$$\int x^2 dx = \frac{x^3}{3}$$

$$\int x dx = \frac{x^2}{2}$$

$$\int 1 dx = x$$

[2/4]

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

$$\text{iii} \quad \int_0^2 (3x^2 + 2x - 5) dx$$

$$\left[\frac{3x^3}{4} + \frac{2x^2}{3} \right]_0^2 \quad \times$$

$$\frac{3(2)^3}{4} + \frac{2(2)^2}{3} = \frac{18}{4} + \frac{8}{3}$$

$$= \frac{18}{4} + \frac{8}{3}$$

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b)

c) find $\int x \cdot \sin x \, dx$ 'by parts'

$$\int u \, dv = \int u \, dv - \int v \, dx$$

$$u = x \quad dv = \sin x \quad [4/10]$$

$$du = dx \quad v = \cos x$$

$$x \times \cos x - \int \cos x \, dx$$