No : ________ Date: __/__/____

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MATH1015 - Quiz 2

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01

Writing as a matrice

$$A = \begin{bmatrix} 0 & 2 & 1 \\ 4 & -1 & 1 \\ -1 & 1 & -3 \end{bmatrix} \qquad B = \begin{bmatrix} 7 \\ -3 \\ 0 \end{bmatrix}.$$

finding along 1^{st} col $\det(A) \rightarrow a_{11}C_{11} + a_{21}C_{21} + a_{31}C_{31}$

$$\det(A) = 0 + 4C_{21} + -1C_{31}$$

$$C_{21} = (-1)^{2+1} \times m_{21} = -1 \times \begin{vmatrix} 2 & 1 \\ 1 & -3 \end{vmatrix} = -1(2\times-3 - 1\times1) = 7$$

$$C_{31} = (-1)^{3+1} \times m_{31} = 1 \times \begin{vmatrix} 2 & 1 \\ -1 & 1 \end{vmatrix} = (2\times1 - (-1)(1)) = 3$$

$$\therefore \det(A) = 4(7) - 3 = 25$$

$$A_1 = \begin{bmatrix} 7 & 2 & 1 \\ -3 & -1 & 1 \\ 0 & 1 & -3 \end{bmatrix}$$

finding along 1^{st} col $\det(A_1) \rightarrow a_{11}C'_{11} + a_{21}C'_{21} + a_{31}C'_{31}$

$$\det(A_1) = 7C'_{11} + -3C'_{21} + 0$$

$$C'_{11} = (-1)^{1+1} \times m'_{11} = 1 \times \begin{vmatrix} -1 & 1 \\ 1 & -3 \end{vmatrix} = (-1\times-3 - 1\times1) = 2$$

$$C'_{21} = (-1)^{2+1} \times m'_{21} = -1 \times \begin{vmatrix} 2 & 1 \\ 1 & -3 \end{vmatrix} = -1(2\times-3 - 1\times1) = 7$$

$\therefore \det(A_1) = 7(2) - 3(7)$

$= -7$

$$x_1 = \frac{\det(A_1)}{\det(A)}$$

$$= \frac{-7}{25}$$

$x_1 = -7/25$

P.T.O →

02

Writing as an augmented matrice

$$[A|b] \rightarrow \left[\begin{array}{cc|c} 3 & 4 & 2 \\ -1 & 1 & -3 \end{array}\right]$$

$R_1 \leftrightarrow R_2$

$R_1 = -1 \times R_1$

$$\left[\begin{array}{cc|c} 1 & -1 & 3 \\ 3 & 4 & 2 \end{array}\right] \qquad R_2' = R_2 - 3R_1$$

$$\left[\begin{array}{cc|c} 1 & -1 & 3 \\ 0 & 7 & -7 \end{array}\right] \qquad R_3' = R_3/7$$

$$\left[\begin{array}{cc|c} 1 & -1 & 3 \\ 0 & 1 & -1 \end{array}\right] \qquad R_1' = R_1 + R_2$$

$$\left[\begin{array}{cc|c} 1 & 0 & 2 \\ 0 & 1 & -1 \end{array}\right]$$

$$\therefore \; x = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 2 \\ -1 \end{bmatrix} //$$

03
(i) If A^{-1} exists then $\det(A) \neq 0$.

$$A = \begin{bmatrix} 2 & 1 \\ -1 & -4 \end{bmatrix}$$

$$\det(A) = 2\times -4 - (-1)(1)$$
$$= -7 \quad \therefore \text{Inverse exists.}$$

$$\cancel{A^{-1} = \frac{1}{2\times-4-(-1)(1)} \begin{bmatrix} 2 -4 & -1 \\ 1 & 2 \end{bmatrix}}$$

$$A^{-1} = \frac{1}{\det(A)} \begin{bmatrix} -4 & -1 \\ 1 & 2 \end{bmatrix}$$

$$= \frac{1}{-7} \begin{bmatrix} -4 & -1 \\ 1 & 2 \end{bmatrix}$$

$$A^{-1} = \begin{bmatrix} 4/7 & 1/7 \\ -1/7 & -2/7 \end{bmatrix}$$

(ii)
$$B = \begin{bmatrix} 1 & -2 & 2 \\ 5 & 1 & 0 \\ 3 & 5 & -4 \end{bmatrix}$$

$$B^{-1} \Rightarrow \left[\begin{array}{ccc|ccc} 1 & -2 & 2 & 1 & 0 & 0 \\ 5 & 1 & 0 & 0 & 1 & 0 \\ 3 & 5 & -4 & 0 & 0 & 1 \end{array}\right] \quad \begin{array}{l} R_2' = R_2 - 5R_1 \\ R_3' = R_3 - 3R_1 \end{array}$$

$$\left[\begin{array}{ccc|ccc} 1 & -2 & 2 & 1 & 0 & 0 \\ 0 & 11 & -10 & -5 & 1 & 0 \\ 0 & 11 & -10 & -3 & 0 & 1 \end{array}\right] \quad R_3' = R_3 - R_2$$

$$\left[\begin{array}{ccc|ccc} 1 & -2 & 2 & 1 & 0 & 0 \\ 0 & 11 & -10 & -5 & 1 & 0 \\ 0 & 0 & 0 & 2 & 0 & 1 \end{array}\right]$$

From Row 3 $\rightarrow$

$$\left.\begin{aligned} 0 &= 2 \\ 0 &= 1 \end{aligned}\right\}$$ Both of which are impossible

$\therefore$ B^{-1} does not exist