

1. You are given the following system of linear equations.

$$\begin{cases} 4x - 6y = 8 \\ x - 2y = 1 \end{cases}$$

(a) (2 points) Identify appropriate matrices A, X, and B to rewrite the system of equations in the form $AX=B$.

$$A = \begin{pmatrix} 4 & -6 \\ 1 & -2 \end{pmatrix} \quad X = \begin{pmatrix} x \\ y \end{pmatrix} \quad B = \begin{pmatrix} 8 \\ 1 \end{pmatrix}$$

(b) (3 points) Find A^{-1} without a calculator. Show work to receive credit.

$$A^{-1} = \frac{1}{-8+6} \begin{pmatrix} -2 & 6 \\ -1 & 4 \end{pmatrix} = -\frac{1}{2} \begin{pmatrix} -2 & 6 \\ -1 & 4 \end{pmatrix} = \begin{pmatrix} 1 & -3 \\ 1/2 & -2 \end{pmatrix}$$

(c) (3 points) Use A^{-1} together with the equation $AX=B$ to solve the system of equations.

$$X = A^{-1}B$$

$$= \begin{pmatrix} 1 & -3 \\ 1/2 & -2 \end{pmatrix} \begin{pmatrix} 8 \\ 1 \end{pmatrix}$$

$$\begin{cases} x = 5 \\ y = 2 \end{cases}$$

$$= \begin{pmatrix} 8-3 \\ 4-2 \end{pmatrix}$$

$$= \begin{pmatrix} 5 \\ 2 \end{pmatrix}$$

+2

2. (4 points) Suppose $A = \begin{bmatrix} 1 & 1 & -2 \\ 3 & 0 & 1 \\ 2 & 1 & 1 \end{bmatrix}$. Use the Gauss-Jordan method and the rref function on your calculator to compute A^{-1} . Show both your initial and final appended matrices. You do not need to show any work.

$$\left(\begin{array}{ccc|ccc} 1 & 1 & -2 & 1 & 0 & 0 \\ 3 & 0 & 1 & 0 & 1 & 0 \\ 2 & 1 & 1 & 0 & 0 & 1 \end{array} \right) \xrightarrow{\text{RREF}} \left(\begin{array}{ccc|ccc} 1 & 0 & 0 & .125 & .375 & -.125 \\ 0 & 1 & 0 & .125 & -.625 & .875 \\ 0 & 0 & 1 & -.375 & -.125 & .375 \end{array} \right)$$

+2 +2

$$A^{-1} = \begin{pmatrix} .125 & .375 & -.125 \\ .125 & -.625 & .875 \\ -.375 & -.125 & .375 \end{pmatrix}$$

3. You are given the following system of linear equations.

$$\begin{cases} 3x - 3y + z = 3 \\ -2x + 2y - z = 1 \\ -4x + 5y - 2z = 0 \end{cases}$$

- (a) (2 points) Identify appropriate matrices A , X , and B to rewrite the system of equations in the form $AX=B$.

$$A = \begin{pmatrix} 3 & -3 & 1 \\ -2 & 2 & -1 \\ -4 & 5 & -2 \end{pmatrix} \quad X = \begin{pmatrix} x \\ y \\ z \end{pmatrix} \quad B = \begin{pmatrix} 3 \\ 1 \\ 0 \end{pmatrix}$$

- (b) (3 points) Find A^{-1} with your calculator.

$$A^{-1} = \begin{pmatrix} 1 & -1 & 1 \\ 0 & -2 & 1 \\ -2 & -3 & 0 \end{pmatrix}$$

- (c) (3 points) Use A^{-1} together with the equation $AX=B$ to solve the system of equations.

$$X = A^{-1}B = \begin{pmatrix} 2 \\ -2 \\ -9 \end{pmatrix} \quad \begin{cases} x = 2 \\ y = -2 \\ z = -9 \end{cases}$$

+2 +1