

Question 1:

(a)[4] The row echelon form of a system of equations is

$$\left[\begin{array}{ccc|c} 1 & 2 & 4 & 4 \\ 0 & 1 & 3 & 2 \\ 0 & 0 & 0 & 0 \end{array} \right]$$

Express the solution set for this system using the variables x , y and z .

(b)[4] Use matrix reduction to solve the following system of equations:

$$\begin{aligned} x - y &= 2 \\ 2x - 3y &= 2 \\ 3x - 5y &= 2 \end{aligned}$$

(c)[2] Is the system of equations in (b) consistent or inconsistent?

Question 2: For this problem use the following matrices:

$$\mathbf{A} = \begin{bmatrix} 4 & 6 \\ -2 & -2 \\ 5 & 9 \end{bmatrix} \quad \mathbf{B} = \begin{bmatrix} -1 & 2 \\ 6 & 7 \end{bmatrix} \quad \mathbf{C} = \begin{bmatrix} 5 & 0 \\ -1 & 3 \\ 4 & 7 \end{bmatrix}$$

(a)[4] Compute $(\mathbf{A} - 2\mathbf{C})\mathbf{B}$

(b)[2] Suppose there is a matrix \mathbf{D} such that the product \mathbf{ADC} is defined. What must be the dimension (or size) of \mathbf{D} ?

(c)[2] Compute $\mathbf{I}_2\mathbf{B} - 3\mathbf{I}_2$.

(d)[2] Assuming \mathbf{B} is invertible, solve the following for x and y :

$$\begin{bmatrix} -1 & 2 \\ 6 & 7 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

Question 3:

(a)[7] Determine \mathbf{A}^{-1} where $\mathbf{A} = \begin{bmatrix} 1 & 3 & 2 \\ 2 & 7 & 3 \\ 1 & 0 & 6 \end{bmatrix}$

(b)[3] Use your result in part (a) to solve the following system of equations:

$$\begin{aligned}x + 3y + 2z &= 0 \\2x + 7y + 3z &= 1 \\x + 6z &= -1\end{aligned}$$

Question 4 [10 points]: A hobby farmer wishes to raise goats and pigs. He wants to raise at most 10 goats and no more than 16 animals in total. A goat costs \$25 to raise and produces a profit of \$14, while each pig costs \$75 to raise and produces a profit of \$40. The farmer has \$900 available for the project. Determine the number of each animal that should be raised to generate the maximum possible profit.

Graph paper is provided on the next page. Carefully set up the problem, identify your variables, neatly sketch any required graphs and state a clear conclusion.

Question 4 (continued)

