

**Question 1:**

(a)[8] Use matrix reduction to solve the following system of equations:

$$6x + y = 8$$

$$x - 3y = -5$$

$$2x + y = 4$$

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

**Question 2:** For this problem use the following matrices:

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

(a)[4] Compute  $(3\mathbf{A} - 4\mathbf{C})\mathbf{D}$

(b)[4] Compute  $\mathbf{AB} - 3\mathbf{I}_3$

(c)[2] Suppose there is some matrix  $\mathbf{P}$  such that the product  $\mathbf{APB}$  is defined. What must be the dimension of the matrix  $\mathbf{P}$ ?

**Question 3:**

(a)[7] Determine  $\mathbf{A}^{-1}$  where  $\mathbf{A}$  is the matrix

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

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

$$\begin{aligned} x - y &= -1 \\ -x + 2y + 3z &= -3 \\ x + 2z &= 5 \end{aligned}$$

**Question 4 [10 points]:** A certain animal requires at least 30 grams of protein and 20 grams of fat each feeding. Two foods are available: food A costs \$0.12 per unit, and each unit provides 6 grams of protein and 2 grams of fat. Food B costs \$0.18 per unit, and each unit supplies 2 grams of protein and 4 grams of fat. At least 2 units of food A must be used each feeding. How many units of foods A and B should be used each feeding to minimize cost?

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

Question 4 (continued)

