

Show all work Be sure to write out each row operation using the appropriate symbols.

For questions 1 through 3, use Gauss-Jordan elimination to solve the system of equations.

1. (10 pts) $3x_1 - 2x_2 = 13$

$$x_1 + 5x_2 = -7$$

2. (12 pts) $x_1 - 2x_2 + x_3 = 9$

$$2x_1 + 3x_2 + 9x_3 = 11$$

$$x_1 - 2x_2 + 3x_3 = 13$$

3. (12 pts) $x_1 + x_2 + x_3 = -8$

$$x_1 + 2x_2 - 3x_3 = 12$$

$$4x_1 + 6x_2 - 4x_3 = 8$$

4. Use matrix methods to find the inverse of each matrix, if it exists.

a. (10 pts) $\begin{bmatrix} 2 & 7 \\ 1 & 3 \end{bmatrix}$

b. (12 pts) $\begin{bmatrix} 1 & 0 & -1 \\ 2 & -1 & 0 \\ 1 & 0 & -2 \end{bmatrix}$

For questions 5 through 7, use the following matrices.

$$A = \begin{bmatrix} 1 & -2 & -3 \\ 4 & -5 & 6 \end{bmatrix} \quad B = \begin{bmatrix} 2 & 0 \\ -1 & 3 \\ 0 & 5 \end{bmatrix} \quad C = \begin{bmatrix} -3 & 4 & -7 \\ 8 & 0 & 2 \end{bmatrix}$$

5. (8 pts) Find $A - C$

6. (8 pts) Find AB

7. (8 pts) Find BC

8. (12 pts) Use Gauss-Jordan elimination to solve the following.

Rob wants to purchase a total of 14 bookshelves that, together, can contain a total of 2500 books. He has three types of bookshelves to choose from: Type A holds 100 books, Type B holds 150 books, and Type C holds 200 books. How many of each type should Rob purchase?

For questions 9 and 10, set up the appropriate system of equations that would be used to solve the problem. DO NOT SOLVE the problem.

9. (8 pts) A sculptor carves three types of statues with a chainsaw: totem poles, bears, and deer. The time required for carving, sanding, and painting each type of statue is shown in the table below. If she has 14 hours available for carving, 15 hours available for sanding, and 21 hours available for painting, how many of each statue should be produced to use all available hours?

	Totem Poles	Bears	Deer
Carving	2 hr	2 hr	1 hr
Sanding	1 hr	2 hr	2 hr
Painting	3 hr	2 hr	2 hr

10. (8 pts) A farmer can buy three types of plant food: Mix A, Mix B, and Mix C. Each barrel of Mix A contains 20 pounds of phosphoric acid, 30 pounds of nitrogen, and 40 pounds of potash. Each barrel of Mix B contains 40 pounds of phosphoric acid, 10 pounds of nitrogen, and 20 pounds of potash. Each barrel of Mix C contains 20 pounds of phosphoric acid, 30 pounds of nitrogen, and 20 pounds of potash. Soil tests indicate that a particular field needs 800 pounds of phosphoric acid, 500 pounds of nitrogen, and 700 pounds of potash. How many barrels of each type of food should the farmer mix together to supply the necessary nutrients for the field?