

PRACTICE TEST #3
MATH 1324

Directions: Answer each question as completely as possible. For calculator problems, write down the matrix that you enter into the calculator as well as the final matrix in reduced form with an interpretation of the final matrix. If a system of equations has no solutions, simply write "No solution." If a system of equations has infinitely many solutions, do two things. First, write "infinitely many solutions." Second, express the relationship among the variables using the parameter(s) or "dummy variable(s)." Third, find one of the infinitely many solutions. In other words, find a general and particular solution.

1. Solve the system of equations.

$$5x + 3y = -1$$

$$8x - 2y = 12$$

2. Solve the system of equations.

$$x + 2y + z = 0$$

$$2x - 3y - 5z = 7$$

$$3x + y + 2z = 17$$

3. Solve the system of equations.

$$10x + y - z + w = 10$$

$$8x - y + z + w = 20$$

$$6x + 2y - 8z + 4w = -10$$

$$4x + 3y - 5z + 3w = 10$$

4. Solve the system of equations.

$$2x - 6y = 18$$

$$-6x + 18y = 0$$

5. Solve the system of equations.

$$x + y + z = 1$$

$$2x - 2y + 10z = 18$$

$$3x - 3y + 15z = 27$$

6. A casting company produces two different bronze sculptures. Sculpture A requires 30 hours for casting and 10 hours for finishing. Sculpture B requires 10 hours for casting and 10 hours for finishing. The casting department has 350 work-hours available per week, and the finishing department has 150 work-hours available per week. If the company wants to operate at full capacity (i.e., use up all the available time), how many of each sculpture should they produce each week?

7. A dietician is to arrange a special diet using three basic foods (A, B, & C). The diet is to include 340 units of calcium, 180 units of iron, and 220 units of vitamin A. The table below lists the number of units of calcium, iron, and vitamin A in each ounce of food. How many ounces of each food must be used to meet the dietary requirements?

UNITS PER OUNCE			
	Food A	Food B	Food C
Calcium	30	10	20
Iron	10	10	20
Vitamin A	10	30	20

8. If $A = \begin{bmatrix} 8 & 3 \\ -1 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 6 \\ 3 & -5 \end{bmatrix}$, find $3A + 6B$.

9. If $A = \begin{bmatrix} 2 & 3 & 4 \\ 0 & -1 & -2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -2 \\ 5 & 3 \\ 10 & 6 \end{bmatrix}$, find AB if possible.

10. If $A = \begin{bmatrix} 2 & 2 \\ 2 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 6 \\ 9 & 12 \end{bmatrix}$, find AB and BA if possible.

11. Find the inverse of matrix A if possible given that $A = \begin{bmatrix} 1 & -1 & 1 \\ 0 & 2 & -1 \\ 2 & 3 & 0 \end{bmatrix}$.

12. Solve the system of equations using the inverse matrix method. Be sure to
(a) write the system in the form $A \cdot X = B$, (b) find A^{-1} , (c) multiply $A^{-1} \cdot B$ to find X .

$$x + 2y = 1$$

$$x + 3y = 3$$

PRACTICE TEST #3
ANSWERS

1. Solve the system of equations.

$$5x + 3y = -1$$

$$8x - 2y = 12$$

$$(1, -2)$$

2. Solve the system of equations.

$$x + 2y + z = 0$$

$$2x - 3y - 5z = 7$$

$$3x + y + 2z = 17$$

$$(5, -4, 3)$$

3. Solve the system of equations.

$$10x + y - z + w = 10$$

$$8x - y + z + w = 20$$

$$6x + 2y - 8z + 4w = -10$$

$$4x + 3y - 5z + 3w = 10$$

$$(0, 5, 10, 15)$$

4. Solve the system of equations.

$$2x - 6y = 18$$

$$-6x + 18y = 0$$

no solution

5. Solve the system of equations.

$$x + y + z = 1$$

$$2x - 2y + 10z = 18$$

$$3x - 3y + 15z = 27$$

1) infinitely many solutions

2) general solution: $(-3z+5, 2z-4, z)$

3) particular solution: $(2, -2, 1)$ when $z = 1$.

There are many possibilities for particular solutions. Select a value for z and substitute into your general solution.

6. A casting company produces two different bronze sculptures. Sculpture A requires 30 hours for casting and 10 hours for finishing. Sculpture B requires 10 hours for casting and 10 hours for finishing. The casting department has 350 work-hours available per week, and the finishing department has 150 work-hours available per week. If the company wants to operate at full capacity (i.e., use up all the available time), how many of each sculpture should they produce each week?

(10 of sculpture A; 5 of sculpture B)

7. A dietician is to arrange a special diet using three basic foods (A, B, & C). The diet is to include 340 units of calcium, 180 units of iron, and 220 units of vitamin A. The table below lists the number of units of calcium, iron, and vitamin A in each ounce of food. How many ounces of each food must be used to meet the dietary requirements?

UNITS PER OUNCE	Food A	Food B	Food C
Calcium	30	10	20
Iron	10	10	20
Vitamin A	10	30	20

(8 oz. food A; 2 oz. of food B; 4 oz. food C)

8. If $A = \begin{bmatrix} 8 & 3 \\ -1 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 6 \\ 3 & -5 \end{bmatrix}$, find $3A + 6B$.

$$3A+6B = \begin{bmatrix} 12 & 45 \\ 15 & -18 \end{bmatrix}$$

9. If $A = \begin{bmatrix} 2 & 3 & 4 \\ 0 & -1 & -2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -2 \\ 5 & 3 \\ 10 & 6 \end{bmatrix}$, find AB if possible.

$$AB = \begin{bmatrix} 57 & 29 \\ -25 & -15 \end{bmatrix}$$

10. If $A = \begin{bmatrix} 2 & 2 \\ 2 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 6 \\ 9 & 12 \end{bmatrix}$, find AB and BA if possible.

$$AB = \begin{bmatrix} 24 & 36 \\ 24 & 36 \end{bmatrix}$$

$$BA = \begin{bmatrix} 18 & 18 \\ 42 & 42 \end{bmatrix}$$

11. Find the inverse of matrix A if possible given that $A = \begin{bmatrix} 1 & -1 & 1 \\ 0 & 2 & -1 \\ 2 & 3 & 0 \end{bmatrix}$.

$$A^{-1} = \begin{bmatrix} 3 & 3 & -1 \\ -2 & -2 & 1 \\ -4 & -5 & 2 \end{bmatrix}$$

12. Solve the system of equations using the inverse matrix method. Be sure to

(a) write the system in the form $A \cdot X = B$, (b) find A^{-1} , (c) multiply $A^{-1} \cdot B$ to find X .

$$x + 2y = 1$$

$$x + 3y = 3$$

(a)
 $A \cdot X = B$

$$\begin{bmatrix} 1 & 2 \\ 1 & 3 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 1 \\ 3 \end{bmatrix}$$

(b)

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

(c)

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

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 3 & -2 \\ -1 & 1 \end{bmatrix} \cdot \begin{bmatrix} 1 \\ 3 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -3 \\ 2 \end{bmatrix}$$

solution: $(-3, 2)$