Exam

Name_____

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Provide an appropriate response.

1) Use matrix multiplication to represent the system: $\begin{cases} 3x + 2y = 2 \\ 4x + y = 5 \end{cases}$

1) _____

2)

   Use matrix multiplication to represent the system: $\begin{cases} 4x \quad\;\; + 6z = 3 \\ x - y + \;\; z = 4 \\ 3x + y - \;\; z = 5 \end{cases}$

2) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

3) If the orders of the matrices Q, R, and S are 4 × 5, 3 × 2, and 5 × 3, respectively, then the order of QRS is

   A) 3 × 3.
   B) 2 × 4.
   C) 3 × 5.
   D) 4 × 5.
   E) none of the above

3) _____

4) $\begin{bmatrix} 1 & -1 \\ 3 & 4 \end{bmatrix}\begin{bmatrix} 0 & 2 \\ 5 & -3 \end{bmatrix} =$

4) _____

   A) $\begin{bmatrix} -2 & 8 \\ 3 & 8 \end{bmatrix}$
   B) $\begin{bmatrix} 4 & -1 \\ 0 & 6 \end{bmatrix}$
   C) $\begin{bmatrix} 6 & 8 \\ -4 & -17 \end{bmatrix}$
   D) $\begin{bmatrix} 0 & -2 \\ 15 & -12 \end{bmatrix}$
   E) $\begin{bmatrix} -5 & 5 \\ 20 & -6 \end{bmatrix}$

5) $\begin{bmatrix} 1 & -1 & 2 \end{bmatrix}\left(\begin{bmatrix} 4 \\ -1 \\ 0 \end{bmatrix}\begin{bmatrix} 2 & 3 \end{bmatrix} + \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ -1 & -1 \end{bmatrix}\right) =$

5) _____

   A) $\begin{bmatrix} 2 & 9 & -3 \end{bmatrix}$
   B) $\begin{bmatrix} 5 \\ -7 \end{bmatrix}$
   C) $\begin{bmatrix} 2 & -3 \\ 4 & 8 \\ 1 & 0 \end{bmatrix}$
   D) $\begin{bmatrix} 9 & 12 \end{bmatrix}$
   E) none of the above

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

6) Let A = $\begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$. Find A^2.

6) _____

7) If A is a 3 × 5 matrix, B is a 5 × 7 matrix, C is a 7 × 11 matrix, D is a 5 × 7 matrix, which of the following matrix products are defined? Give the size of each answer if it is defined.
   (a) A × B × C
   (b) B × C × D
   (c) A × D × C
   (d) A × B × D

7) _____

8) Let $A = \begin{bmatrix} 1 & 1 \\ 2 & -1 \end{bmatrix}$; $B = \begin{bmatrix} 3 & -5 \\ -9 & 2 \end{bmatrix}$; $C = \begin{bmatrix} -2 & 2 \\ 4 & -1 \end{bmatrix}$. Find $A[B + 2C]$

8) _____

9) Give an example of 2 matrices A and B where A × B ≠ B × A.

9) _____

10) The price charged for 2 different CDs at two different stores can be represented by the matrix $P = \begin{bmatrix} 14 & 16 \\ 13 & 15 \end{bmatrix}$ Store A. The quantities of each CD sold at each store can be

represented by the matrix $Q = \begin{bmatrix} 20 & 30 \\ 25 & 40 \end{bmatrix}$. Show that the transpose of the income generated $(PQ)^T$ is equal to the product of the transposes of P and Q in reverse order, $Q^T P^T$.

10) _____

Set up a matrix equation with integer values that is equivalent to the system of equations.

11)
$$\begin{cases} y = -\dfrac{3}{4}x + 3 \\ y = -\dfrac{1}{5}x + \dfrac{9}{5} \end{cases}$$

11) _____

Provide an appropriate response.

12) If $A = \begin{bmatrix} 5 & -2 \\ -4 & 3 \\ 1 & 4 \end{bmatrix}$ and $C = \begin{bmatrix} 6 & 8 \\ 2 & -1 \end{bmatrix}$, find AC.

12) _____

13) If $B = \begin{bmatrix} 7 & 5 & 0 \\ -2 & 1 & 1 \\ 1 & -3 & -5 \end{bmatrix}$ and $C = \begin{bmatrix} 6 & 8 \\ 2 & -1 \end{bmatrix}$, find BC.

13) _____

14) If $A = \begin{bmatrix} 5 & -2 \\ -4 & 3 \\ 1 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 7 & 5 & 0 \\ -2 & 1 & 1 \\ 1 & -3 & -5 \end{bmatrix}$, and $C = \begin{bmatrix} 2 & -4 \\ 5 & 7 \\ -4 & 9 \end{bmatrix}$, find $BA - C$.

14) _____

15) Reduce the matrix: $\begin{bmatrix} 1 & 2 & 0 \\ 3 & -5 & 2 \end{bmatrix}$

15) _____

16) Reduce the matrix: $\begin{bmatrix} 2 & 1 & -1 \\ 4 & 0 & 1 \end{bmatrix}$

16) _____

17)

Using the method of reduction, solve the system: $\begin{cases} 2x - y - 4z = 0 \\ 4x + y - 2z = 0 \\ x - y - 3z = 0 \end{cases}$

17) _____

18)

Using the method of reduction, solve the system: $\begin{cases} 3x - 2y + z = -1 \\ 2x - y - z = 5 \\ 2x + 3z = 4 \end{cases}$

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

19)

Reducing $\begin{bmatrix} 2 & 2 & 4 \\ 1 & 1 & 2 \\ 1 & 0 & 1 \end{bmatrix}$ gives

A) $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 0 \end{bmatrix}$
B) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$
C) $\begin{bmatrix} 1 & 1 & 2 \\ 0 & 0 & 0 \\ 1 & 0 & 1 \end{bmatrix}$
D) $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 2 \\ 0 & 0 & 0 \end{bmatrix}$
E) $\begin{bmatrix} 1 & 0 & 3 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$

20)

If $\begin{cases} x + y - 3z = 5 \\ x - 3y + z = -7 \\ 2x - y - 3z = 2 \end{cases}$, then

A) $x = 5 - 3z$, $y = 3 + 4z$, and $z = t$.
B) $x = 5$, $y = -8$, and $z = 12$.
C) $x = 2 - 4z$, $y = -5 + 2z$, and $z = t$.
D) $x = 3$, $y = -1$, and $z = 4$.
E) none of the above

21)

If $\begin{cases} x - 2y - 4z = 4 \\ 2x + y + z = 9 \\ x + y - z = 1 \end{cases}$, then

A) $x = 5$, $y = -\dfrac{5}{2}$, and $z = \dfrac{3}{2}$

B) $x = 4 - \dfrac{13}{2}z$, $y = \dfrac{11}{2} - \dfrac{1}{6}z$, and $z = t$

C) $x = 2z$, $y = 3 - 4z$, and $z = t$

D) $x = \dfrac{22}{5}$, $y = \dfrac{1}{5}$, and $z = 0$

E) none of the above

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

22) Solve the following system of equations by reducing the matrix:
$\begin{cases} 2x + y = 11 \\ 9x + 5y = 7 \end{cases}$

23) Solve the following system of equations by reducing the matrix:
$\begin{cases} x - y - 3z = 2 \\ 2x - y - 4z = 3 \\ x + y - z = 1 \end{cases}$

24) For what values of *a* will the following system of equations have a solution?

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

24) _____

25) Solve by the method of reduction:

$$\begin{cases} 2x - 9y = 10 \\ x - 6y = 14 \end{cases}$$

25) _____

26) Solve by the method of reduction:

$$\begin{cases} 3x - 5y = 2 \\ 18x - 30y = 14 \end{cases}$$

26) _____

27) Solve by the method of reduction:

$$\begin{cases} 5x + 3y + z = 2 \\ 2x - y + 2z = 10 \\ 4x - 2y + 3z = 17 \end{cases}$$

27) _____

28) Solve by the method of reduction:

$$\begin{cases} 3x - 2y + 5z = 7 \\ x + y - z = 2 \\ 5x + 3z = 11 \end{cases}$$

28) _____

29) Solve by the method of reduction:

$$\begin{cases} x + 2y - 5z = 1 \\ 3x - 4y - 11z = 6 \\ -2x - 6y - 16z = -5 \end{cases}$$

29) _____

1) $\begin{bmatrix} 3 & 2 \\ 4 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 \\ 5 \end{bmatrix}$

2) $\begin{bmatrix} 4 & 0 & 6 \\ 1 & -1 & 1 \\ 3 & 1 & -1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 3 \\ 4 \\ 5 \end{bmatrix}$

3) E

4) E

5) D

6) $\begin{bmatrix} 5 & 0 \\ 0 & 5 \end{bmatrix}$

7) (a) 3×11

   (b) not defined

   (c) 3×11

   (d) not defined

8) $\begin{bmatrix} -2 & -1 \\ -1 & -2 \end{bmatrix}$

9) $\begin{bmatrix} 0 & 1 \\ 2 & 0 \end{bmatrix}; \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$; many possible answers

10) $(PQ)^T = \left(\begin{bmatrix} 14 & 16 \\ 13 & 15 \end{bmatrix}\begin{bmatrix} 20 & 30 \\ 25 & 40 \end{bmatrix}\right)^T$

$= \begin{bmatrix} 680 & 1060 \\ 635 & 990 \end{bmatrix}^T = \begin{bmatrix} 680 & 635 \\ 1060 & 990 \end{bmatrix}$

$Q^T P^T = \begin{bmatrix} 20 & 30 \\ 25 & 40 \end{bmatrix}^T \begin{bmatrix} 14 & 16 \\ 13 & 15 \end{bmatrix}^T$

$= \begin{bmatrix} 20 & 25 \\ 30 & 40 \end{bmatrix}\begin{bmatrix} 14 & 13 \\ 16 & 15 \end{bmatrix}$

$= \begin{bmatrix} 680 & 635 \\ 1060 & 990 \end{bmatrix}$

11) $\begin{bmatrix} 3 & 4 \\ 1 & 5 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 12 \\ 9 \end{bmatrix}$

12) $\begin{bmatrix} 26 & 42 \\ -18 & -35 \\ 14 & 4 \end{bmatrix}$

13) can't be done

14) $\begin{bmatrix} 13 & 5 \\ -18 & 4 \\ 16 & -40 \end{bmatrix}$

15) $\begin{bmatrix} 1 & 0 & \dfrac{4}{11} \\ 0 & 1 & -\dfrac{2}{11} \end{bmatrix}$

16) $\begin{bmatrix} 1 & 0 & \dfrac{1}{4} \\ 0 & 1 & -\dfrac{3}{2} \end{bmatrix}$

17) $x = z, y = -2z, z = t$

18) $x = 5, y = 7, z = -2$
19) A
20) E
21) A
22) $x = 48; y = -85$
23) $x = \dfrac{1}{2}; y = 0; z = -\dfrac{1}{2}$

24) $a = \dfrac{7}{2}$

25) $x = -22, y = -6$
26) no solution
27) $x = 1, y = -2, z = 3$
28) $x = \dfrac{11}{5} - \dfrac{3}{5}r, y = \dfrac{-1}{5} + \dfrac{8}{5}r, z = r,$ where r is any real number

29) $x = \dfrac{41}{26}, y = 0, z = \dfrac{3}{26}$