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TEST №15: Matrices

Instructions: Mark questions 1-18 with True or False. Explain your answer shortly. Solve 19-30. Each question 1-18 is worth 3 points (1 for T or F and 2 for the explanation). Each question 19-30 is worth 5 points. The bonus question is worth 6 points. TOTAL – 120 POINTS.

1. A 2x3 matrix has three columns and two rows.

2. The transpose of a 5x6 matrix has five columns and six rows.

3. If A is a 2x3 matrix and B is a 3x2 matrix, then A+B is defined.

4. If A is a 2x3 matrix and B is a 3x2 matrix, then A-B is defined.

5. If A is a 2x3 matrix and B is a 3x2 matrix, then AB is defined.

6. If A is an invertible 3x3 matrix and B is a 3x4 matrix, then $A^{-1}B$ is defined.

7. It is never true that A+B, A-B, and AB are all defined.

8. If AB is defined, then BA must also be defined.

9. If AB and BA are both defined, they may have different dimensions.

10. If AB and BA are both defined and have the same dimensions, then they are equal.

11. If AX = B for any matrix A, then $X = A^{-1}B$.

12. If AX = B for a square matrix A, then $X = A^{-1}B$.
13. If AX = B for an invertible matrix A, then $X = A^{-1}B$.

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14. The most efficient way to solve AX = B is to invert A.

15. Every matrix none of whose entries are zero is invertible.

16. Every invertible matrix is square and has no two rows the same.

17. If sector A of the economy uses none of the products of sector B, then any increase in demand for the products of sector A will have no effect on sector B.

18. You can see the complete effect of one sector on another only by looking at the whole economy.

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

20. Find the product AB for the matrices in problem 19.

21. Which of the following is **NOT** defined?

    a. $[2 \quad 4]\begin{bmatrix} 3 \\ 1 \end{bmatrix}$

    b. $\begin{bmatrix} 3 & 4 \\ -1 & -2 \end{bmatrix}\begin{bmatrix} -1 \\ 2 \end{bmatrix}$

    c. $\begin{bmatrix} 2 & -1 & 3 \\ 0 & 4 & -2 \end{bmatrix}\begin{bmatrix} -3 & 1 \\ 2 & 5 \end{bmatrix}$

    d. $\begin{bmatrix} -3 & 1 \\ 2 & 5 \end{bmatrix}\begin{bmatrix} 2 & -1 & 3 \\ 0 & 4 & -2 \end{bmatrix}$

22. Find a, b, c and d so that:

$$\begin{bmatrix} 2 & -3 \\ 0 & 1 \end{bmatrix} + \begin{bmatrix} a & b \\ c & d \end{bmatrix} = \begin{bmatrix} 1 & -2 \\ 3 & -4 \end{bmatrix}$$

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23. Solve for x and y:

$$\begin{bmatrix} -3 & 2 \\ y & x \end{bmatrix}\begin{bmatrix} -2 & 5 \\ x & y \end{bmatrix} = \begin{bmatrix} y & -7 \\ -7 & 16 \end{bmatrix}$$

24. Kristi bought 7 shares of gazooks.com, 9 shares of chuckle.com and 8 shares of rich.com. The following month she bought 2 shares of gazooks.com and 6 shares of rich.com. Write this information in a 2x3 matrix.

25. Find the inverse of M:

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

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26. A theater has 900 seats. If there are two types of tickets, of $5 and $7, how many of each type of ticket should the theater sell for the three nights in order to bring in each the returns in the table. Use matrices to solve.

	Show 1	**Show 2**	**Show 3**
# of tickets sold	900	900	900
Returns	$5 300	$5 500	$5 700

27. Write the minor of a_{21} for $\begin{vmatrix} -2 & -2 & -2 \\ 5 & 3 & 0 \\ 7 & -4 & 8 \end{vmatrix}$.

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28. Evaluate $\begin{vmatrix} a & b & a \\ d & e & d \\ g & h & g \end{vmatrix}$.

29. Use Cramer's rule to solve for z only.

$$2x - y + 4z = -2$$
$$3x + 2y - z = -3$$
$$x + 4y + 2z = 17$$

30. Solve to 2 significant digits using Cramer's rule.

$$0.9973x - 0.9957y = 0$$
$$0.0732x + 0.0924y = 112$$

BONUS: Write a system of two equations with two variables which **<u>cannot</u>** be solved using Cramer's rule.