Unit 1 Review – Matrices

Name Answer Key

Scientific calculator (not TI-36 PRO) only on questions 1-29.

Identify the order (dimensions) of each of the following matrices.

1. $\begin{bmatrix} 1 & 0 & -2 \\ 3 & 1 & 4 \end{bmatrix}$ 2x3

2. $\begin{bmatrix} 1 & 0 \\ 3 & 1 \\ -2 & 5 \end{bmatrix}$ 3x2

3. $\begin{bmatrix} 2 & -1 & 2 \\ 3 & 1 & 4 \\ 2 & 7 & 0 \end{bmatrix}$ 3x3

Given matrices $A, B, C, and\ D$, perform the following operations if possible. If not possible, state the reason.

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

4. $3B$ $\begin{bmatrix} 9 \\ -3 \\ 6 \end{bmatrix}$

5. $C - [3 \quad 1 \quad -2]$ Undefined; not the same dimensions.

6. $C \cdot D$ $\begin{bmatrix} -10 & -10 \\ 7 & 1 \end{bmatrix}$

7. $D \cdot C$ $\begin{bmatrix} -9 & 15 & -1 \\ 6 & -3 & 17 \\ 6 & -9 & 3 \end{bmatrix}$

Given the following matrices, perform the indicated operation, if possible. If not possible, state the reason.

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

$E = \begin{bmatrix} -1 & -3 \\ 1 & 2 \end{bmatrix}$ $F = \begin{bmatrix} 0 & 2 & 2 \\ 3 & 0 & 1 \end{bmatrix}$ $G = \begin{bmatrix} 1 & 1 \\ 3 & -2 \end{bmatrix}$

8. $3G + 2E$ $\begin{bmatrix} 1 & -3 \\ 11 & -2 \end{bmatrix}$

9. $A - \frac{1}{2}B$ $\begin{bmatrix} -4 \\ 1 \\ -\frac{1}{2} \end{bmatrix}$

10. $4GE$ $\begin{bmatrix} 0 & -4 \\ -20 & -52 \end{bmatrix}$

11. DF 3x3; 2x3 undefined since columns of D ≠ rows of F

Find the determinant of each of the following matrices.

12. $\begin{bmatrix} 2 & 5 \\ 3 & 1 \end{bmatrix}$ -13

13. $\begin{bmatrix} 1 & -2 \\ -3 & 6 \end{bmatrix}$ 0

14. $\begin{bmatrix} 2 & 1 & 0 \\ 3 & 1 & -1 \\ 1 & -2 & 2 \end{bmatrix}$ -7

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

Find the area of the polygon with the given vertices.

16. $A(0,1), B(2,7), C(5,5)$ 11 square units

17. $A(1,3), B(-2,6), C(-1,1), D(2,8)$

$\pm\frac{1}{2}\begin{vmatrix} -2 & -1 & 1 & 2 & -2 \\ 6 & 1 & 3 & 8 & 6 \end{vmatrix}$

$= \pm\frac{1}{2}[(-2-3+8+12) - (-6+1+6-16)]$

$= \frac{1}{2}(15+15)$

15 sq units

Find the inverse of each of the following matrices.

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

19. $\begin{bmatrix}-1 & 2\\ 2 & -3\end{bmatrix}$ ← $\begin{bmatrix}3 & 2\\ 2 & 1\end{bmatrix}$

Find an $a, b, c, and\ d$ that would make the following equation true.

20. $\begin{bmatrix}2 & 1\\ -5 & -3\end{bmatrix}\cdot\begin{bmatrix}a & b\\ c & d\end{bmatrix}=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ $\begin{bmatrix}3 & 1\\ -5 & -2\end{bmatrix}$

21. Use inverse matrices to solve the system. Show ALL work, no technology assistance!

$$3x+2y=14$$
$$-2x+4y=-4$$

(4, 1)

Solve the following matrix equations

22. $2X=\begin{bmatrix}6 & 0\\ 8 & -2\\ 1 & 4\end{bmatrix}$ $X=\begin{bmatrix}3 & 0\\ 4 & -1\\ \frac{1}{2} & 2\end{bmatrix}$

23. $\begin{bmatrix}-3 & 2 & 0\\ 1 & 5 & 1\end{bmatrix}+X=\begin{bmatrix}1 & 3 & -2\\ 0 & 2 & -2\end{bmatrix}$ $X=\begin{bmatrix}4 & 1 & -2\\ -1 & -3 & -3\end{bmatrix}$

24. $3X-\begin{bmatrix}0\\ 4\\ 1\end{bmatrix}=\begin{bmatrix}3\\ 2\\ -1\end{bmatrix}$ $X=\begin{bmatrix}1\\ 2\\ 0\end{bmatrix}$

Solve the following systems using the stated method.

25. Cramer's Rule
$$3x-y=6$$
$$-x+3y=-2$$
(2, 0)

26. ~~Substitution~~
$$-3x+4y=8$$
$$x+2y=14$$
(4, 5)

27. Elimination
$$x-y+2z=1$$
$$x+y+z=8$$
$$2x-y+2z=4$$
(3, 4, 1)

28. Substitution (0, −2, 2)
$$-x+y+2z=2$$
$$2x+y-z=-4$$
$$x+2y+3z=2$$

29. [redacted] (3, 2, 1)
$$-3x+4y+2z=1$$
$$x+2y-z=6$$
$$2x-y+3z=7$$

You may use a graphing calculator or TI-36Pro on this part of the review (test) only.

Find the inverse of each of the following matrices.

30. $\begin{bmatrix}2 & 1 & 0\\ 3 & 1 & -1\\ 1 & -2 & 2\end{bmatrix}$ $\begin{bmatrix}0 & \frac{2}{7} & \frac{1}{7}\\ 1 & -\frac{4}{7} & -\frac{3}{7}\\ 1 & -\frac{5}{7} & \frac{1}{7}\end{bmatrix}$

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

Solve the system using an inverse matrix.

32.
$$x+y+z=-1$$
$$2x-y+2z=-5$$
$$-x+2y-z=4$$

$|A|=0$ so no unique solution.

33.
$$3x+2y+2z=-1$$
$$-3x+y-3z=0$$
$$x+2y+z=0$$
(−1, 0, 1)

***A problem about encoding/decoding will also be included on the test.**