Name: _____ **Class:** _____ **Date:** _____ **ID: X**

Algebra 2 (H) Unit 10 Matrices Practice Test

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1. Use the price list for one-day admissions to the community pool given below to write a matrix that represents the additional cost for nonresidents.

Residents

Time of Day	Child	Adult
Before 6:00 P.M.	$5.00	$6.50
After 6:00 P.M.	$4.00	$5.50

Nonresidents

Time of Day	Child	Adult
Before 6:00 P.M.	$6.00	$8.00
After 6:00 P.M.	$5.50	$7.50

a.
$$\begin{array}{r} \\ \text{Before 6:00} \\ \text{After 6:00} \end{array} \begin{array}{c} \begin{array}{cc} \text{Child} & \text{Adult} \end{array} \\ \begin{bmatrix} 1.00 & 1.50 \\ 1.50 & 2.00 \end{bmatrix} \end{array}$$

b.
$$\begin{array}{r} \\ \text{Before 6:00} \\ \text{After 6:00} \end{array} \begin{array}{c} \begin{array}{cc} \text{Child} & \text{Adult} \end{array} \\ \begin{bmatrix} 6.00 & 8.00 \\ 5.50 & 7.50 \end{bmatrix} \end{array}$$

c.
$$\begin{array}{r} \\ \text{Before 6:00} \\ \text{After 6:00} \end{array} \begin{array}{c} \begin{array}{cc} \text{Child} & \text{Adult} \end{array} \\ \begin{bmatrix} 5.00 & 6.50 \\ 4.00 & 5.50 \end{bmatrix} \end{array}$$

d.
$$\begin{array}{r} \\ \text{Before 6:00} \\ \text{After 6:00} \end{array} \begin{array}{c} \begin{array}{cccc} \text{Resident Child} & \text{Resident Adult} & \text{Nonresident Child} & \text{Nonresident Adult} \end{array} \\ \begin{bmatrix} 5.00 & 6.50 & 6.00 & 8.00 \\ 4.00 & 5.50 & 5.50 & 7.50 \end{bmatrix} \end{array}$$

Name: _____ **ID: X**

Find the value of the determinant.

____ 2. $\begin{vmatrix} 2 & -5 \\ -1 & -3 \end{vmatrix}$

a. –17
b. –13
c. –11
d. 1

____ 3. $\begin{vmatrix} 5 & 9 \\ -2 & 6 \end{vmatrix}$

a. –42
b. 48
c. –64
d. 57

Evaluate the determinant using expansion by minors.

____ 4. $\begin{vmatrix} -4 & 4 & 1 \\ 2 & -1 & 1 \\ 2 & 2 & 0 \end{vmatrix}$

a. –6
b. –22
c. 22
d. –14

Determine whether the given matrices are inverses.

____ 5. $A = \begin{bmatrix} -2 & -2 \\ 2 & -1 \end{bmatrix} \quad B = \begin{bmatrix} 1 & -1 \\ -1 & 2 \end{bmatrix}$

a. No
b. Yes

Write a matrix equation for the given systems of equations.

____ 6. $5x - 6y - 5z = 2$
$4y - 5z = -3$
$4y + 2z = 2$

a. $\begin{bmatrix} 5 & -6 & -5 \\ 0 & 4 & -5 \\ 0 & 4 & 2 \end{bmatrix} \cdot \begin{bmatrix} 2 \\ -3 \\ 2 \end{bmatrix} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$

b. $\begin{bmatrix} 5-6-5 \\ 4-5 \\ 4+2 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ -3 \\ 2 \end{bmatrix}$

c. $\begin{bmatrix} 5 & -6 & -5 \\ 0 & 4 & -5 \\ 0 & 4 & 2 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ -3 \\ 2 \end{bmatrix}$

d. $\begin{bmatrix} 5 & -6 & -5 \\ 4 & -5 & 0 \\ 4 & 2 & 0 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ -3 \\ 2 \end{bmatrix}$

Name: _____ **ID: X**

Short Answer

7. Write the dimensions of the given matrix. $\begin{bmatrix} 2 & 0 \\ -9 & 1 \\ 1 & -1 \\ 5 & 4 \end{bmatrix}$

Perform the indicated matrix operation.

8. $\begin{bmatrix} 2 & 5 \\ -9 & -2 \end{bmatrix} + \frac{1}{2}\begin{bmatrix} 0 & 6 \\ -2 & -6 \end{bmatrix}$

9. $3\begin{bmatrix} 8 & 8 \\ -8 & -8 \end{bmatrix} - 2\begin{bmatrix} 0 & 8 \\ -6 & -10 \end{bmatrix}$

Find the product, if possible.

10. $\begin{bmatrix} 1 & 9 \\ -2 & 6 \end{bmatrix} \cdot \begin{bmatrix} 2 & 6 \\ 0 & -5 \end{bmatrix}$

Find the inverse of the matrix, if it exists. Write as fractions.

11. $P = \begin{bmatrix} 2 & 3 \\ 3 & -5 \end{bmatrix}$

Solve the matrix equation by using inverse matrices. Must show work for multiplication.

12. $\begin{bmatrix} 4 & 4 \\ -2 & 4 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 4 \\ 34 \end{bmatrix}$

13. $\begin{bmatrix} 4 & 6 \\ -1 & 2 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 40 \\ 18 \end{bmatrix}$

14. $\begin{bmatrix} 6 & -1 & 4 \\ -1 & -3 & 1 \\ 2 & 2 & -5 \end{bmatrix} \bullet \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 6 \\ 31 \\ -42 \end{bmatrix}$ Must show work for multiplication.

Algebra 2 (H) Unit 10 Matrices Practice Test
Answer Section

MULTIPLE CHOICE

1. ANS: A
Organize the additional cost for nonresident children and adults in labeled columns and rows, and then write the data in a matrix form.

	Feedback
A	Correct!
B	Does this matrix represent the additional costs for nonresidents?
C	This matrix shows the prices for residents.
D	Did you write the correct matrix?

PTS: 1 DIF: Average REF: Lesson 4-1 OBJ: 4-1.1 Organize data in matrices.
NAT: NA 1 | NA 8 | NA 9 | NA 10 | NA 2 STA: 5.12.1
TOP: Organize data in matrices. KEY: Matrices | Organize Data
MSC: 1998 Lesson 4-1

2. ANS: C
The value of the second-order determinant is obtained by calculating the difference of the products of the two diagonals.

	Feedback
A	First, find the products of the diagonals and then find their difference.
B	Did you use the definition of determinant correctly?
C	Correct!
D	The value of the second-order determinant is obtained by calculating the difference of the products of the two diagonals.

PTS: 1 DIF: Basic REF: Lesson 4-5
OBJ: 4-5.1 Evaluate the determinant of a 2 x 2 matrix. NAT: NA 1 | NA 4 | NA 7 | NA 9 | NA 2
TOP: Evaluate the determinant of a 2 x 2 matrix. KEY: Matrices | Determinants
MSC: 1998 Lesson 3-3 | 1998 Lesson 4-4

3. ANS: B
The value of the second-order determinant is obtained by calculating the difference of the products of the two diagonals.

$$\begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc$$

	Feedback
A	The value of the second-order determinant is obtained by calculating the difference of the products of the two diagonals.
B	Correct!
C	Find the products of the diagonals and then find their difference.
D	Did you use the definition of determinant correctly?

PTS: 1 DIF: Basic REF: Lesson 4-5
OBJ: 4-5.1 Evaluate the determinant of a 2 x 2 matrix. NAT: NA 1 | NA 4 | NA 7 | NA 9 | NA 2
TOP: Evaluate the determinant of a 2 x 2 matrix. KEY: Matrices | Determinants
MSC: 1998 Lesson 3-3 | 1998 Lesson 4-4

4. ANS: C
To use expansion by minors with third-order determinants, each member of one row is multiplied by its minor and position sign, and the results are added together. The position signs alternate between positive and negative, beginning with a positive sign in the first row and first column.

	Feedback
A	The minor of an element is the determinant formed when the row and column containing that element are deleted.
B	Multiply each element of a row with its minor and positive sign, and then add the results.
C	Correct!
D	Did you evaluate the determinant correctly?

PTS: 1 DIF: Average REF: Lesson 4-5
OBJ: 4-5.2 Evaluate the determinant of a 3 x 3 matrix using expansion by minors.
NAT: NA 1 | NA 4 | NA 7 | NA 9 | NA 2
TOP: Evaluate the determinant of a 3 x 3 matrix using expansion by minors.
KEY: Matrices | Determinants | Expansion by Minors MSC: 1998 Lesson 3-3 | 1998 Lesson 4-4

5. ANS: A
Two matrices are inverses of each other if their product is the identity matrix.

	Feedback
A	Correct!
B	Two matrices are inverses of each other if their product is the identity matrix.

PTS: 1 DIF: Average REF: Lesson 4-6
OBJ: 4-6.1 Determine whether two matrices are inverses. NAT: NA 1 | NA 6 | NA 9 | NA 10 | NA 2
TOP: Determine whether two matrices are inverses. KEY: Matrices | Inverses of Matrices
MSC: 1998 Lesson 4-5

6. ANS: C
The matrix equation is (coefficient matrix) · (variable matrix) = constant matrix.

	Feedback
A	Write the matrix on the left as the product of the coefficients and the variables.
B	Did you determine the coefficient, variable, and constant matrices correctly?
C	Correct!
D	What is a matrix equation?

PTS: 1 DIF: Average REF: Lesson 4-6
OBJ: 4-6.3 Write matrix equations for systems of equations. NAT: NA 1 | NA 7 | NA 8 | NA 10 | NA 2
TOP: Write matrix equations for systems of equations.
KEY: Matrix Equations | System of Equations MSC: 1998 Lesson 4-6

SHORT ANSWER

7. ANS:
4x2

The dimensions of a matrix is given by $m \times n$, where m is the number of rows and n is the number of columns.

PTS: 1 DIF: Basic REF: Lesson 4-1 OBJ: 4-1.3 Solve multi-step problems.
NAT: NA 1 | NA 8 | NA 9 | NA 10 | NA 2 STA: 5.12.1
TOP: Solve multi-step problems.

8. ANS:
$$\begin{bmatrix} 2 & 8 \\ -10 & -5 \end{bmatrix}$$
The order of operations for matrices is similar to that of real numbers.
Perform scalar multiplication before matrix addition and subtraction.

PTS: 1 DIF: Average REF: Lesson 4-2 OBJ: 4-2.1 Add matrices.
NAT: NA 1 | NA 5 | NA 6 | NA 10 | NA 2 STA: 5.12.1
TOP: Add matrices. KEY: Matrices | Add Matrices
MSC: 1998 Lesson 4-1 | 1998 Lesson 4-2

9. ANS:
$$\begin{bmatrix} 24 & 8 \\ -12 & -4 \end{bmatrix}$$
The order of operations for matrices is similar to that of real numbers. Perform scalar multiplication before matrix addition and subtraction.

PTS: 1 DIF: Average REF: Lesson 4-2 OBJ: 4-2.2 Subtract matrices.
NAT: NA 1 | NA 5 | NA 6 | NA 10 | NA 2 STA: 5.12.1
TOP: Subtract matrices. KEY: Matrices | Subtract Matrices
MSC: 1998 Lesson 4-1 | 1998 Lesson 4-2

10. ANS:
$\begin{bmatrix} 2 & -39 \\ -4 & -42 \end{bmatrix}$
Multiplication of matrices is possible if and only if the number of columns in the first matrix is equal to the number of rows in the second matrix.

PTS: 1 DIF: Advanced REF: Lesson 4-3 OBJ: 4-3.1 Multiply matrices.
NAT: NA 1 | NA 3 | NA 6 | NA 10 | NA 2 TOP: Multiply matrices.
KEY: Matrices | Multiply Matrices MSC: 1998 Lesson 4-3

11. ANS:
$\begin{bmatrix} 5/19 & 3/19 \\ 3/19 & -2/19 \end{bmatrix}$
The inverse of a matrix $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is equal to $\frac{1}{ad-bc}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$. If the determinant equals zero, the inverse does not exist.

PTS: 1 DIF: Average REF: Lesson 4-6
OBJ: 4-6.2 Find the inverse of a 2 x 2 matrix. NAT: NA 1 | NA 6 | NA 9 | NA 10 | NA 2
TOP: Find the inverse of a 2 x 2 matrix. KEY: Matrices | Inverses of Matrices
MSC: 1998 Lesson 4-5

12. ANS:
(–5, 6)
Write a matrix equation for the system of equations. Then, find the inverse of the coefficient matrix. Finally, multiply each side of the matrix equation by the inverse matrix.

PTS: 1 DIF: Advanced REF: Lesson 4-6
OBJ: 4-6.4 Solve systems of equations using matrix equations. NAT: NA 1 | NA 7 | NA 8 | NA 10 | NA 2
TOP: Solve systems of equations using matrix equations.
KEY: Matrix Equations | System of Equations MSC: 1998 Lesson 4-6

13. ANS:
(–2, 8)
Write a matrix equation for the system of equations. Then, find the inverse of the coefficient matrix. Finally, multiply each side of the matrix equation by the inverse matrix.

PTS: 1 DIF: Advanced REF: Lesson 4-6
OBJ: 4-6.4 Solve systems of equations using matrix equations. NAT: NA 1 | NA 7 | NA 8 | NA 10 | NA 2
TOP: Solve systems of equations using matrix equations.
KEY: Matrix Equations | System of Equations MSC: 1998 Lesson 4-6

14. ANS:

$$\begin{bmatrix} -3 \\ -8 \\ 4 \end{bmatrix}$$

Write a matrix equation for the system of equations. Then, find the inverse of the coefficient matrix. Finally, multiply each side of the matrix equation by the inverse matrix.

PTS: 1 DIF: Advanced REF: Lesson 4-6
OBJ: 4-6.4 Solve systems of equations using matrix equations. NAT: NA 1 | NA 7 | NA 8 | NA 10 | NA 2
TOP: Solve systems of equations using matrix equations.
KEY: Matrix Equations | System of Equations MSC: 1998 Lesson 4-6