Honors Precalculus Name:_____ Per: _____

Chapter 7 PRACTICE TEST *Use an additional sheet, if necessary, to show your work*

1. Solve by substitution or elimination.

$2x - 3y = -13$

$y = 2x + 7$

$2x - 3(2x+7) = -13$

$2x - 6x - 21 = -13$

$-4x = 8$

$x = -2$

$y = 2(-2) + 7$

$y = -4 + 7$

$y = 3$

$(-2, 3)$

2. Solve by substitution or elimination.

$4x + 3y = 0$

$2(2x - y) = 0(2)$

$4x + 3y = 0$

$-4x - 2y = 0$

$\frac{5y}{5} = \frac{0}{5}$

$y = 0$

$4x + 3(0) = 0$

$4x + 0 = 0$

$\frac{4x}{4} = \frac{0}{4}$

$x = 0$

$(0, 0)$

3. If you are solving a system and the following happens, what do you conclude?

a) You get a statement that 4 = 4.

Infinite solutions ⇒ same line

algebraically

b) You get a statement that $-2 \neq 6$

No Solution ⇒ parallel lines that never cross

algebraically

4. You are offered two sales jobs. One offers an annual salary of $55,000 plus 1.5% of your yearly sales. The other offers $52,000 plus 2% of your yearly sales. How much do you have to sell in order for the second to be a better deal?

x = yearly sales

$55{,}000 + 0.015x = 52{,}000 + 0.02x$

$\frac{3000}{0.005} = \frac{0.005x}{0.005}$

$600{,}000 = x$

You need to sell more than $600,000 for the 2nd to be better.

5. Use back substitution to solve.

$x - 7y + 8z = -14$

$y - 9z = 26$

$z = -3$

$y - 9(-3) = 26$

$y + 27 = 26$

$y = -1$

$x - 7(-1) + 8(-3) = -14$

$x + 7 - 24 = -14$

$x - 17 = -14$

$x = 3$

$(3, -1, -3)$

6. Get the following to Row Echelon form.

$2x + 6z = -9$

$3x - 2y + 11z = -16$

$3x - y + 7z = -11$

① $R_2 - R_3 \to R_2$

$2x + 6z = -9$

$-y + 4z = -5$

$3x - y + 7z = -11$

② $3R_1 - 2R_3 \to R_3$

$2x + 6z = -9$

$-y + 4z = -5$

$2y + 4z = -5$

③ $2R_2 + R_3 \to R_3$

$2x + 6z = -9$

$-y + 4z = -5$

$12z = -15$

④ $\frac{1}{12} R_3 \to R_3$

$2x + 6z = -9$

$-y + 4z = -5$

$z = -1.25$

You would solve through back substitution.

7. Write the following as an augmented matrix and then use a calculator to get it to RREF to solve it.

$2x + 6z = -9$

$3x - 2y + 11z = -16$

$3x - y + 7z = -11$

$M = \begin{bmatrix} 2 & 0 & 6 & -9 \\ 3 & -2 & 11 & -16 \\ 3 & -1 & 7 & -11 \end{bmatrix}$

$\text{rref}(M) = \begin{bmatrix} 1 & 0 & 0 & -0.75 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & -1.25 \end{bmatrix}$ (x y z)

$(-0.75, 0, -1.25)$ (x y z)

8. Let A and B be the matrices shown. Find the following:

$A = \begin{bmatrix} 5 & 4 \\ -2 & 9 \end{bmatrix}$ $B = \begin{bmatrix} 8 & 2 \\ -4 & 0 \end{bmatrix}$

B + A

$\begin{bmatrix} 13 & 6 \\ -6 & 9 \end{bmatrix}$

A – 2B

$\begin{bmatrix} 5 & 4 \\ -2 & 9 \end{bmatrix} - \begin{bmatrix} 16 & 4 \\ -8 & 0 \end{bmatrix}$

$\begin{bmatrix} -11 & 0 \\ 6 & 9 \end{bmatrix}$

9. Let A and B be the same matrices as in Problem 8.

a) Find AB. $\begin{bmatrix} 5 & 4 \\ -2 & 9 \end{bmatrix} \cdot \begin{bmatrix} 8 & 2 \\ -4 & 0 \end{bmatrix}$ (2×2 · 2×2)

$\begin{bmatrix} 5(8)+4(-4) & 5(2)+4(0) \\ -2(8)+9(-4) & -2(2)+9(0) \end{bmatrix} = \begin{bmatrix} 24 & 10 \\ -52 & -4 \end{bmatrix}$

b) If $\frac{1}{2}X - B = A$, find matrix X.

$2\left(\frac{1}{2}X\right) = 2(A+B)$

$X = 2A + 2B$

$2(A+B)$

$X = 2(A+B)$

$X = 2\begin{bmatrix} 13 & 6 \\ -6 & 9 \end{bmatrix} = \begin{bmatrix} 26 & 12 \\ -12 & 18 \end{bmatrix}$

10. Let A be the same matrix as in Problem 8.

a) What are the dimensions of a matrix K if $A \cdot K = L$ and the dimensions of matrix L are 2×5?

$A \cdot K = L$

$2\times 2 \quad 2\times 5 \quad 2\times 5$

K is 2×5

b) Provide dimensions for a matrix D so that $A \cdot D$ is undefined.

Any matrix where the number of rows for D is not 2 would be undefined.

Example: if D was 3×4.

11. Find the inverse matrix for matrix T.

$T = \begin{bmatrix} 5 & 2 \\ -7 & 3 \end{bmatrix}$ (a, b, c, d)

$T^{-1} = \frac{1}{ad-bc}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

$T^{-1} = \frac{1}{15-(-14)}\begin{bmatrix} 3 & -2 \\ 7 & 5 \end{bmatrix} = \frac{1}{29}\begin{bmatrix} 3 & -2 \\ 7 & 5 \end{bmatrix}$

12. Show the matrix you found in Problem 11 is the inverse of matrix T.

$T^{-1} \cdot T = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$\frac{1}{29}\begin{bmatrix} 3 & -2 \\ 7 & 5 \end{bmatrix}\begin{bmatrix} 5 & 2 \\ -7 & 3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$\frac{1}{29}\begin{bmatrix} 15+14 & 6+(-6) \\ 35+(-35) & 14+15 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$\frac{1}{29}\begin{bmatrix} 29 & 0 \\ 0 & 29 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ ✓

13. Use an inverse matrix to solve the following system of equations and show your steps.

$2x + 3y = -10$

$4x - y = 1$

Write as a matrix equation first

$\begin{bmatrix} 2 & 3 \\ 4 & -1 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -10 \\ 1 \end{bmatrix}$

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

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

Use a calculator

$X = \begin{bmatrix} -0.5 \\ -3 \end{bmatrix} \Rightarrow (-0.5, -3)$ (x, y)

14. State the determinant of the following matrix and whether that indicates it has an inverse or not.

$M = \begin{bmatrix} 12 & 4 \\ -9 & -3 \end{bmatrix}$

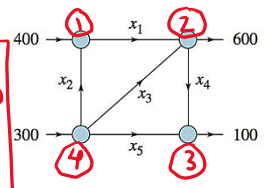
$\det(M) = 12(-3) - 4(-9)$

$= -36 + 36$

$\det(M) = 0$

Since $\det(M) = 0$, M does not have an inverse.

15. The flow of traffic (in vehicles/hr) through a network of streets is shown. Solve the system and provide a possible traffic flow.



1) $x_1 = 400 + x_2$

2) $x_1 + x_3 = x_4 + 600$

3) $x_4 + x_5 = 100$

4) $x_2 + x_3 + x_5 = 300$

$x_1 - x_2 = 400$

$x_1 + x_3 - x_4 = 600$

$x_4 + x_5 = 100$

$x_2 + x_3 + x_5 = 300$

$M = \begin{array}{c} x_1 \; x_2 \; x_3 \; x_4 \; x_5 \\ \begin{bmatrix} 1 & -1 & 0 & 0 & 0 & 400 \\ 1 & 0 & 1 & -1 & 0 & 600 \\ 0 & 0 & 0 & 1 & 1 & 100 \\ 0 & 1 & 1 & 0 & 1 & 300 \end{bmatrix} \end{array}$

$\text{rref}(M) = \begin{bmatrix} 1 & 0 & 1 & 0 & 1 & 700 \\ 0 & 1 & 1 & 0 & 1 & 300 \\ 0 & 0 & 0 & 1 & 1 & 100 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$

$x_1 = 700 - x_3 - x_5$

$x_2 = 300 - x_3 - x_5$

$x_4 = 100 - x_5$

We get to pick x_3 and x_5.

$x_3 = 100$

$x_5 = 50$

$x_1 = 550$

$x_2 = 150$

$x_3 = 100$

$x_4 = 50$

$x_5 = 50$