Name: Key **Period:** _____ **Date:** _____

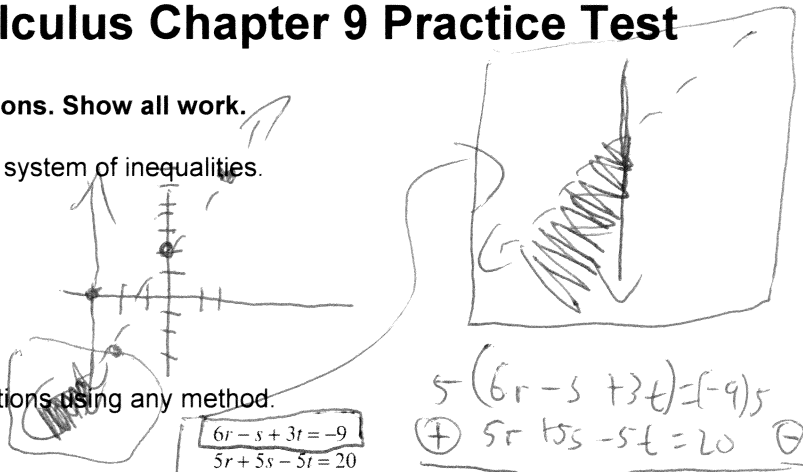
PreCalculus Chapter 9 Practice Test

Answer the following questions. Show all work.

1. Sketch the solution to each system of inequalities.

$x \le -3$

$y < \frac{5}{3}x + 2$



2. Solve each system of equations using any method.

$-4x + 9y = 9$

$x - 3y = -6$

$x = -6 + 3y$

$-4(-6+3y) + 9y = 9$

$24 - 12y + 9y = 9$

$24 - 3y = 9$

$-3y = -15$ $\boxed{y = 5}$

$x - 3(5) = -6$

$x - 15 = -6$

$\boxed{x = 9}$

$6r - s + 3t = -9$

$5r + 5s - 5t = 20$

$3r - s + 4t = -5$

$5(6r - s + 3t) = (-9)5$ $6r - s + 3t = -9$

$\oplus\ 5r + 5s - 5t = 20$ $\ominus\ 3r - s + 4t = -5$

$35r + 10t = -25$ $\leftarrow 3r - t = -4$

$\oplus\ 10(3r - t) = (-4)10.$ $3(-1) - t = -4$

$65r = -65$ $-t = -1$

$\boxed{r = -1}$ $\boxed{t = 1}$

$3(-1) - s + 4(1) = -5$

$-3 - s + 4 = -5$ $\boxed{s = 6}$

$-s = -6$

3. Write the system of linear equation as an **augmented matrix**, and solve the system using **row-echelon form**.

$-x + y = 1$

$-2x - 3y - z = -2$

$-3x - y - 2z = -1$

$\Rightarrow \begin{bmatrix} -1 & 1 & 0 & 1 \\ -2 & -3 & -1 & -2 \\ -3 & -1 & -2 & -1 \end{bmatrix} \xrightarrow{-1R_1} \begin{bmatrix} 1 & -1 & 0 & -1 \\ -2 & -3 & -1 & -2 \\ -3 & 1 & -2 & -1 \end{bmatrix} \xrightarrow[3R_1+R_3]{2R_1+R_2} \begin{bmatrix} 1 & -1 & 0 & -1 \\ 0 & -5 & -1 & -4 \\ 0 & -4 & -2 & -4 \end{bmatrix}$

$\xrightarrow{-1R_2} \begin{bmatrix} 1 & -1 & 0 & -1 \\ 0 & 5 & 1 & 4 \\ 0 & -4 & -2 & -4 \end{bmatrix} \xrightarrow{R_3+R_2} \begin{bmatrix} 1 & -1 & 0 & -1 \\ 0 & 1 & -1 & 0 \\ 0 & -4 & -2 & -4 \end{bmatrix} \xrightarrow{4R_2+R_3} \begin{bmatrix} 1 & -1 & 0 & -1 \\ 0 & 1 & -1 & 0 \\ 0 & 0 & -6 & -4 \end{bmatrix} \xrightarrow{-\frac{1}{6}R_3} \begin{bmatrix} 1 & -1 & 0 & -1 \\ 0 & 1 & -1 & 0 \\ 0 & 0 & 1 & 2/3 \end{bmatrix}$

$x - y = -1$

$y - z = 0$ $\boxed{y = 2/3}$ $\boxed{x = -1/3}$

$\boxed{z = 2/3}$

4. Perform each matrix operation, **if possible**.

$A = \begin{bmatrix} 2 & 3 & 6 \\ 4 & 0 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 & 2 \\ 3 & 1 & -1 \\ -2 & 2 & 3 \end{bmatrix}$, $C = \begin{bmatrix} 2 & 1 & 1 \\ 3 & 0 & 1 \\ 2 & -1 & 0 \end{bmatrix}$

2×3 3×3

a. $B + C$

$= \begin{bmatrix} 3 & 1 & 3 \\ 6 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$

b. AB

$\begin{bmatrix} (2\cdot1)+(3\cdot3)+(6\cdot-2) & (2\cdot0)+(3\cdot1)+(6\cdot2) & (2\cdot2)+(3\cdot-1)+(6\cdot3) \\ (4\cdot1)+0+-2 & 0+0+2 & 8+0+3 \end{bmatrix}$

$= \begin{bmatrix} -1 & 15 & 19 \\ 2 & 2 & 11 \end{bmatrix}$

c. BA und.

d. BC

$= \begin{bmatrix} 2+0+4 & 1+0-2 & 1+0+0 \\ 6+3-2 & 3+0+1 & 3+1+0 \\ -4+6+6 & -2+0-3 & -2+2+0 \end{bmatrix}$

$= \begin{bmatrix} 6 & -1 & 1 \\ 7 & 4 & 4 \\ 8 & -5 & 0 \end{bmatrix}$

5. Use **Cramer's Rule** to solve the following system of linear equation.

$$-7x + y = -19$$
$$-2x + 3y = -19$$

$\begin{bmatrix} -7 & 1 \\ -2 & 3 \end{bmatrix}$ $\begin{bmatrix} -19 \\ -19 \end{bmatrix}$

Denom: $\left|\begin{bmatrix} -7 & 1 \\ -2 & 3 \end{bmatrix}\right| = -21 - -2 = \boxed{-19}$

$x = \dfrac{\left|\begin{bmatrix} -19 & 1 \\ -19 & 3 \end{bmatrix}\right|}{-19} = \dfrac{-38}{+19} = \boxed{2}$ $\quad y = \dfrac{\left|\begin{bmatrix} -7 & -19 \\ -2 & -19 \end{bmatrix}\right|}{-19} = \dfrac{95}{-19} = \boxed{-4}$

6. Use **Cramer's Rule** to solve the following system of linear equation.

$$-5x + 3y + 6z = 4$$
$$-3x + y + 5z = -5$$
$$-4x + 2y + z = 13$$

$\Rightarrow \begin{bmatrix} -5 & 3 & 6 \\ -3 & 1 & 5 \\ -4 & 2 & 1 \end{bmatrix}$ $\begin{bmatrix} 4 \\ -5 \\ 13 \end{bmatrix}$

Denom: $\left|\begin{bmatrix} -5 & 3 & 6 \\ -3 & 1 & 5 \\ -4 & 2 & 1 \end{bmatrix}\right| = -3\left|\begin{bmatrix} 3 & 6 \\ 2 & 1 \end{bmatrix}\right| + 1\left|\begin{bmatrix} -5 & 6 \\ -4 & 1 \end{bmatrix}\right| - 2\left|\begin{bmatrix} -5 & 6 \\ -3 & 5 \end{bmatrix}\right|$

$-5 + 24 + 14$

$-3(17) + 1(19) - 2(-7) = \boxed{-18}$

$x = \dfrac{\left|\begin{bmatrix} 4 & 3 & 6 \\ -5 & 1 & 5 \\ 13 & 2 & 1 \end{bmatrix}\right|}{-18}$, $y = \dfrac{\left|\begin{bmatrix} -5 & 4 & 6 \\ -3 & -5 & 5 \\ -4 & 13 & 1 \end{bmatrix}\right|}{-18}$, $z = \dfrac{\left|\begin{bmatrix} -5 & 3 & 4 \\ -3 & 1 & -5 \\ -4 & 2 & 13 \end{bmatrix}\right|}{-18}$

$\dfrac{3\left|\begin{bmatrix} -5 & 5 \\ 13 & 1 \end{bmatrix}\right| + 1\left|\begin{bmatrix} 4 & 6 \\ 13 & 1 \end{bmatrix}\right| - 2\left|\begin{bmatrix} 4 & 6 \\ -5 & 5 \end{bmatrix}\right|}{-18}$ $\quad \dfrac{6\left|\begin{bmatrix} -3 & -5 \\ -4 & 13 \end{bmatrix}\right| - 5\left|\begin{bmatrix} -5 & 4 \\ -4 & 13 \end{bmatrix}\right| + 1\left|\begin{bmatrix} -5 & 4 \\ -3 & -5 \end{bmatrix}\right|}{-18}$

plug

$-3(-2) + (4) + 5z = 5$

$z = 3$.

$= \dfrac{-3(-70) + (-74) - 2(50)}{-18} = \boxed{-2}$ $\quad = \dfrac{6(-59) - 5(-49) + (37)}{-18} = \boxed{4}$

7. Monica decided to divide a total of $42,000 into three investments: a savings account paying 5% interest, a time deposit paying 7%, and a bond paying 9%. Her total annual interest from the three investments was $2600, and the interest from the savings account was$200 less than the total interest from the other two investments. How much did she invest at each rate?

x = \$ investment into savings, y = \$ investment into time dep, z = \$ invest into bond,

$x + y + z = 42{,}000$

$.05x + .07y + .09z = 2600$

$.05x = (.07y + .09z) - 200$

$x + y + z = 42{,}000$

$\Rightarrow 5x + 7y + 9z = 260{,}000$

$5x = 7y + 9z - 20000$

$\Rightarrow 5x + 20000 = 7y + 9z$.

Subs + rule

$5x + (5x + 20000) = 260{,}000$

$10x = 240{,}000$

$x = 24{,}000$

$\Rightarrow$ $y + z = 18{,}000$

$7y + 9z = 120{,}000$

$\Rightarrow -2$ $7y + 7z = 126{,}000$

$7y + 9z = 140{,}000$

$-2z = 14{,}000$

$z = 7{,}000$

$y = 11{,}000$

8. Write the **Invertibility Criterion**.

A matrix is invertible (has an inverse) if and only if its determinant is non zero ($\det \neq 0$).