**Pre Calculus** **Ch 8 Matrix Practice & systems**

**Name:**____ ***ANSWERS*** _____**Date:**_____**Per:**_____

**SHOW [Type/Pen] ALL WORK UNDER PROBLEMs FOR CREDIT➔** ***ans.*** **in** ***blue*****}**

**1)** A company that manufactures bicycles, has a fixed cost of $100,000. It costs $100 to produce each bicycle. The selling prices is $300 per bike. Determine the **break-even point**, explain what this point means and determine what is the minimum number of bikes that need to be sold to start making a profit.

C(*x*)= **100X + 100,000** R(*x*)= **300X**

$300x = 100x + 100{,}000$

$3x = x + 1000$

$2x = 1000$

**X = 500**

$C(500) = 100(500) + 100{,}000$

$= 50{,}000 + 100{,}000$

$= \mathbf{150{,}000}$

**2)** For the linear function f(x) = ***m***x + **b**, $f(-3) = 23$ *and* $f(2) = -7$. **Find *m* and b.**

Set up a *system to solve this →

$$\begin{cases} 23 = -3m + b \\ -7 = 2m + b \end{cases} \rightarrow \begin{array}{r} 23 = -3m + b \\ -7 = 2m + b \\ \hline 30 = -5m \end{array}$$

**m = - 6**

$-7 = 2(-6) + b$

$-7 = -12 + b$

**b = 5**

3) The sum of three times a first number [***f***] and twice a second number [***n***] is 8. If the second number is subtracted from twice the first number the result is 3. **Find the numbers**. [Declare Variables & Set up a *system to solve] →

***VARs***:

| | |
|---|---|
| Let ***f*** = | the value of the first number |
| Let ***n*** = | the value of the second number |

$$\begin{cases} 3f + 2n = 8 \\ 2f - n = 3 \end{cases} \rightarrow \begin{array}{r} 3f + 2n = 8 \\ 4f - 2n = 6 \\ \hline 7f = 14 \end{array}$$

**f = 2**

$3(2) + 2n = 8$

$6 + 2n = 8$

$2n = 2$

**n = 1**

4) The "**solution**" to a System of Linear equations in ***2-variables*** is called a(n)?

**5)** The "**solution**" to a System of Linear equations in ***3-variables*** is called a(n)?

6) List **ALL 5 ways** that may be used to *solve* a System of Linear equations.

7) ***Write a Matrix equation*** for the *system use to solve *prob. #3* above.

**[hint: must be in standard form]➔**

$$\begin{cases} 3x + 2y = 8 \\ 2x - y = 3 \end{cases}$$

8) Given the matrix **A** below, Find: a) the ***Order of Matrix A***

b) the ***Scalar Product***

$$\mathbf{A} = 5\begin{bmatrix} 5 & -8 & 0 \\ 7 & 1 & -2 \\ 3 & 2 & 6 \end{bmatrix}$$

1)

Break-even point: (500, 150000)

Explain: If the company produces 500 bikes @ a cost of $150,000, there is no Profit OR loss.

_____

Minimum number of bikes to start making a **profit**➔

2) The value of b = ___5___

The value of m = __- 6 __

3)

First # → **2**

Second # → **1**

**4)**

**Ordered Pair**

**5)**

**Ordered Triple**

6) **Graphing**
**Substitution**
**Addition/Elimination**
**Cramer's Rule**
**Matrix Equations**

7)

$$\begin{bmatrix} 3 & 2 \\ 2 & -1 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 8 \\ 3 \end{bmatrix}$$

8)

a) _____**3x3**_____

b)
$$\begin{bmatrix} 25 & -40 & 0 \\ 35 & 5 & -10 \\ 15 & 10 & 30 \end{bmatrix}$$

9)

**(-6, – 2)**

10) **a) square matrix**

**b) ad – bc ≠ 0**

**c) commutative property**

9) **Solve** the following *system* by **using Cramer's Rule**. **SHOW ALL WORK FOR CREDIT!!** **Set up each determinant.**

$$\begin{cases} 2x - 7y = 2 \\ 3x + y = -20 \end{cases}$$

Coeff→ $\begin{vmatrix} 2 & -7 \\ 3 & 1 \end{vmatrix}$

**det = 23**

x→ $\dfrac{\begin{vmatrix} 2 & -7 \\ -20 & 1 \end{vmatrix}}{23} = \dfrac{-138}{23}$

**x = -6**

y→ $\dfrac{\begin{vmatrix} 2 & 2 \\ 3 & -20 \end{vmatrix}}{23} = \dfrac{-46}{23}$

**y = – 2**

**(-6, – 2)**

10) Fill in the blanks: a) To use Cramer's Rule The matrix must be a __**square matrix**__.

b) If A = $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$, the **Matrix** is **Invertible** If and only if __**ad – bc ≠ 0**__.

c) What property of Algebra does not work with Matrices? __**commutative property.**__

**EXTRA CREDIT➔** Solve the following system using Cramer's Rule. ➔ **Ans:** **(– 1, 3, 2)**

Show the set-up of the ***Major and Minor(s) determinants***. **[Use a calculator to evaluate the determinants.]**

$$\begin{cases} 2x + 2y + 3z = 10 \\ 4x - y + z = -5 \\ 5x - 2y + 6z = 1 \end{cases}$$

$D = \begin{vmatrix} 2 & 2 & 3 \\ 4 & -1 & 1 \\ 5 & -2 & 6 \end{vmatrix}$ ➔ **D = – 55**

$D_x = \begin{vmatrix} 10 & 2 & 3 \\ -5 & -1 & 1 \\ 1 & -2 & 6 \end{vmatrix}$ $D_y = \begin{vmatrix} 2 & 10 & 3 \\ 4 & -5 & 1 \\ 5 & 1 & 6 \end{vmatrix}$ $D_z = \begin{vmatrix} 2 & 2 & 10 \\ 4 & -1 & -5 \\ 5 & -2 & 1 \end{vmatrix}$

**$D_x$ = 55** **$D_y$ = –165** **$D_z$ = –110**

$x = \dfrac{55}{-55}$ $y = \dfrac{-165}{-55}$ $z = \dfrac{-110}{-55}$

**x = –1** **y = 3** **z = 2**