

Using a Graphing Calculator With Cramer's Rule

Directions: Follow along with this activity sheet using your TI-83 Plus graphing calculator. Complete the questions as you continue the activity and hand this activity packet in to me when you are finished. Have fun!!

WARM-UP! Before beginning this activity packet, exercise your brain by finding the values of the two variables in the following pairs of equations using Cramer's Rule. Please write your answers in ordered pairs when you are finished.

1. $3x + 4y = -7$
 $2x + y = -3$

2. $2x + 3y = 13$
 $x - 4y = 1$

NOTE THIS! We already have the definition for a determinant and for a matrix. Every square matrix has a determinant. The determinant has the same elements as the matrix, but they are enclosed between vertical bars instead of brackets.

LET'S GET STARTED! Complete the following steps.

1. Begin this activity by turning your TI-83 Plus graphing calculator on. Let's start off by simply finding a 2×2 determinant. Make sure that the screen on your calculator is clear. We are going to enter a 2×2 matrix into the calculator. To do this, press the yellow **[2nd]** key and then the **[x⁻¹]** / **[MATRX]** key. This should bring up the following screen:

```
NAME: MATH EDIT
1: [A] 1x1
2: [B] 3x2
3: [C] 1x1
4: [D]
5: [E]
6: [F]
7↓ [G]
```

Don't panic if either you don't have numbers under the **MATH** column, or if yours don't match the ones on the screen, we will be altering these throughout the activity anyway.

2. Press the **▶** key twice until **EDIT** is highlighted (blackened) at the top of your screen. The "1:" should be highlighted. Press the **ENTER** key. This should bring up a screen similar to the following: (Remember, the numbers don't matter at this point, we will be changing these.)

```
MATRIX[A] 1 x1
[ 0                ]
```

3. The blinking cursor should be on the first number at the top of the screen. This is where we enter the size of our matrix.
 - What is the size of our matrix, from the previous directions? _____

Press **2**, followed by the **ENTER** key, and then repeat those two steps one more time. The steps we just did should make your screen match the answer that you gave above. If it does not, rethink your answer, or ask myself or another student for help. When we enter the size of our matrix into the calculator, it automatically creates the correct number of entry spaces into the matrix.

4. The first position in the matrix should now be highlighted, as shown below.

your screen. Finish this step off by pressing the \square key and press **ENTER** one last time.

- What answer did you get? _____

6. Let's make sure that we got the correct answer. Solve the determinant in the space provided below on your own and make sure that the answer you get and the answer the calculator got are the same.

7. Steps 1 through 6 showed you how to enter a 2×2 matrix into your calculator and find the determinant of it.

- What steps would change if we decided to enter a 3×3 matrix instead?

- Could we find the determinant of a 4×5 matrix? Why or why not?

8. Enter the following matrix into your calculator: $\begin{bmatrix} 7 & 5 \\ 2 & -1 \end{bmatrix}$. If you need to refresh your memory on how to do this, refer back to steps 1 through 6.

- What is the answer when you solve this determinant? _____

CHALLENGE YOUR BRAIN!

9. We have learned in class how to solve two equations with two unknowns using Cramer's Rule. Solve the following pairs of equations using Cramer's Rule and your graphing calculator. Remember that you will be using two determinants (matrices) each for x and y . Please write down the answers you receive from your calculator for each determinant as you go along. Then write your final answer as an ordered pair.

1. $4x + 7y = 22$

$$8x - 2y = -5$$

2. $0.2a - 0.3b = 0$

$$0.4a - 0.2b = 0.2$$

- What did you notice about either the numbers given in the equations, or the answers you got with the calculator that may have made your work more difficult if you did not have a calculator? Why would they have made your work more difficult?

ANALYZE WHAT YOU LEARNED! We're almost done!

- Do you think that we could use Cramer's Rule and a graphing calculator to solve three equations with three unknowns? Why or why not?

- Create a pair of equations to be solved by Cramer's Rule that would be extremely difficult to solve by hand and write it in the space provided below. Why would that pair of equations be difficult to solve by hand?

- Name one problem you ran into while completing this activity packet. What did you do to fix it and what could you do to avoid this problem next time?

YOU'RE FINISHED! Make sure that you answered all of the questions completely in this activity packet and hand it in to me before you leave class today.