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Graphing Calculator Activity

Intention: The intention of this assignment is to show students how to enter matrices. There is

an accompanying worksheet they will have to complete. The students would have just learned

how to add and subtract matrices by hand.   The following instructions for students will allow

them to input all information into the TI-89 titanium calculator.

Directions: This packet will teach you how to input matrices into the TI-89 titanium
calculator. There is an accompanying worksheet you will need to fill out and return at the end
of the week. When you turn in this worksheet you will receive five extra credit points. You
must answer ALL questions to get all of the points. If the entire worksheet is not completed
you will receive no credit for this extra credit assignment.

1) Turning on the calculator and making sure all variables are cleared.

    a. To turn on the calculator press the [ON] button in the lower left hand corner of the

        calculator. The main screen will appear:
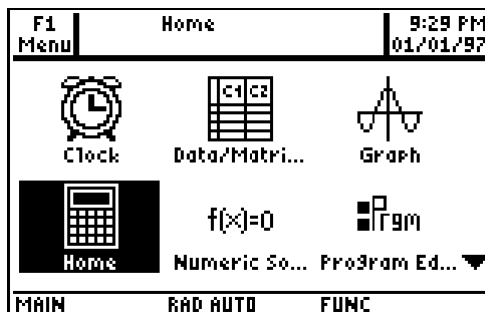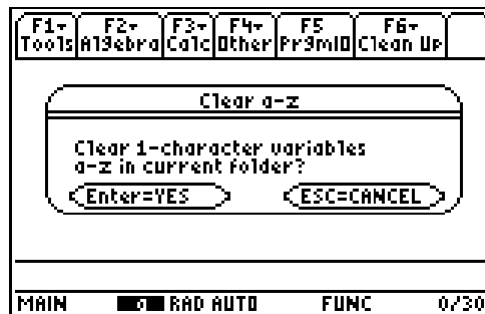

    b. Once the calculator is on make sure "home" with the calculator is highlighted as

        is in the picture above. Press [ENTER].

c. Press ⌷2nd⌷, ⌷ and this screen will appear:

Make sure number 1 is highlighted like the above picture and press ⌷ENTER⌷. This

screen will appear:

Press ⌷ENTER⌷. This will clear all variables.

    i. The variable clearing step is important because there could be other

       applications stored in the variables we are going to use to define our

       matrices. Once we clear all the variables there will be no confusion when

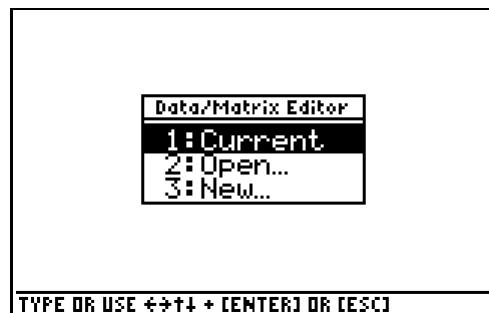   it comes time to calculate our matrices.

2) Inputting matrices

    a. We need to open the matrix editor application. To do this press $\boxed{\text{APPS}}$, (this will take you back to the main screen) ⊝, ⓓ. Now "Data/Matri…" will be highlighted like so:
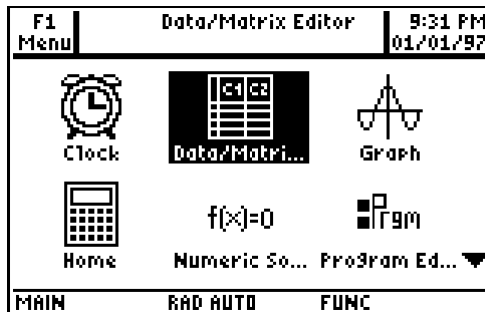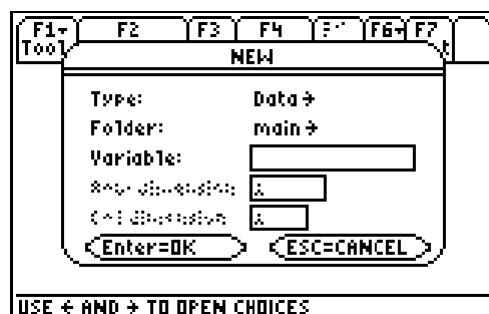

Press $\boxed{\text{ENTER}}$.

        i. This box will pop up on the screen:

Press $\boxed{3}$. Now the screen should look like this:

    b. We need to change the type from *Data* to *Matrix*. To do this press ⓓ, ⊝, $\boxed{\text{ENTER}}$.

c. Press ⊖, ⊖, your cursor will now be blinking in the variable box. Now we will define our variable. When you create a matrix you assign it a variable so when you are doing calculations you use that variable to do calculations on the home screen.

d. We will define our variable as 'a'. To do this press ⊟. The alpha button is already on. If the alpha button was not on you would need to press alpha, ⊟ to get the letter 'a'. To determine if you are in "alpha mode", the screen will have a little letter 'a' highlighted in black at the bottom of the screen like so:
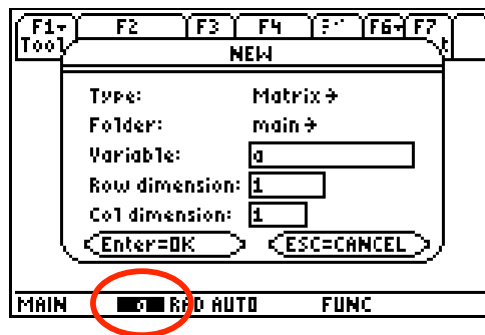

If you notice the alpha button is white and the letters above the buttons are white. This is a guide that will help you find the letters on your TI-89 titanium calculator.

e. We will make a 3x3 matrix. To do this you press ⊖ so your cursor is in the row dimension box and press alpha 3. You need to press alpha because if not you would have entered the letter 's' in the row dimension box.

f. Press ⊖ so your cursor is in the col dimension box and press 3.

g. Your screen should look like this:
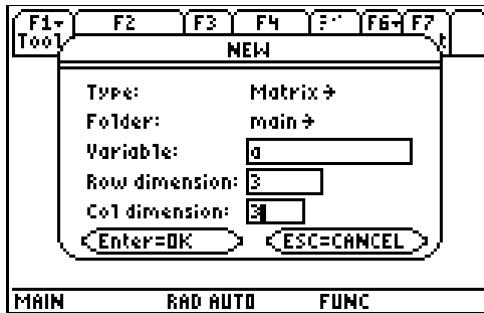
h. Press ⌊ENTER⌋ ⌊ENTER⌋. The following screen will come up:
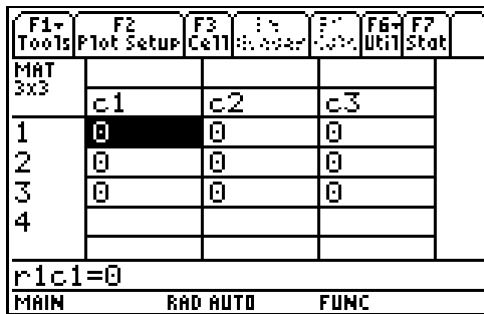
3) Inputting numbers into the matrix editor.

a. We are going to input the following 3x3 matrix: $\begin{vmatrix} 3 & 8 & 12 \\ 7 & 5 & 2 \\ 0 & 1 & 17 \end{vmatrix}$

b. When you enter a number and press ⌊ENTER⌋ the cursor moves to the right. When you get to the end of the row the cursor will return to the first position in the next row. So to enter numbers you simply start from the upper left corner working your way across to the right, then moving to the next row down.

   i. To enter the first matrix press: ⌊3⌋, ⌊ENTER⌋, ⌊8⌋, ⌊ENTER⌋, ⌊1⌋⌊2⌋, ⌊ENTER⌋, ⌊7⌋, ⌊ENTER⌋, ⌊5⌋, ⌊ENTER⌋, ⌊2⌋, ⌊ENTER⌋, ⌊0⌋, ⌊ENTER⌋, ⌊1⌋, ⌊ENTER⌋, ⌊1⌋⌊7⌋, ⌊ENTER⌋.

c. To enter another matrix press ⌊APPS⌋, ⌊ENTER⌋, ⌊3⌋. Change the type from *Data* to *Matrix*. To do this press ⊙, ⊖, ⌊ENTER⌋. Press ⊖, ⊖ to enter a variable. Enter

'b' for a variable, to do this press ⬚(⬚. Press ⊖ to enter the row dimension, press

[alpha] [3]. Press ⊖ to enter the col dimension, press [3]. Last press [ENTER] [ENTER].

d. Input the following matrix: $\begin{vmatrix} 6 & -1 & 9 \\ 10 & 14 & 2 \\ 22 & 7 & -13 \end{vmatrix}$ → Refer to part b for help. ** Note:

to enter a negative number press [(-)] and then the numbers.**

4) Calculating Matrices

a. Once both matrices are inputted press [HOME].

   i. This will take you back to the home screen.

b. Now put the calculator aside for a minute. Add by hand and fill in the answer

matrix after the equals sign:

$\begin{vmatrix} 3 & 8 & 12 \\ 7 & 5 & 2 \\ 0 & 1 & 17 \end{vmatrix} + \begin{vmatrix} 6 & -1 & 9 \\ 10 & 14 & 2 \\ 22 & 7 & -13 \end{vmatrix} =$

c. Now we are ready to make the same calculation on the calculator. To enter the

above calculation press [alpha], [=], [+], [alpha], ⬚(⬚, [ENTER]. The answer matrix will

appear on the screen.
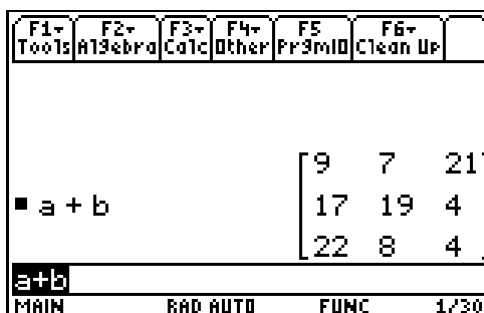
** Does this match your answer?

d. Put the calculator aside again and subtract by hand and fill in the answer matrix

after the equals sign:

$$\begin{vmatrix} 3 & 8 & 12 \\ 7 & 5 & 2 \\ 0 & 1 & 17 \end{vmatrix} + \begin{vmatrix} 6 & -1 & 9 \\ 10 & 14 & 2 \\ 22 & 7 & -13 \end{vmatrix} =$$

e. Now we will subtract the matrices. To enter this calculation press $\boxed{\text{CLEAR}}$, $\boxed{\text{alpha}}$,

$\boxed{=}$, $\boxed{-}$, $\boxed{\text{alpha}}$, $\boxed{(}$, $\boxed{\text{ENTER}}$. The answer matrix will appear on the screen.

5) Complete the following worksheet.

Graphing Calculator Worksheet

Name:_____   Date:_____

Directions: First enter the following matrices into your calculator using the assigned variables. Then compute the matrix calculations following the list of matrices. Remember to clear the variables before you begin entering the matrices. Also remember that you can only add and/or subtract matrices of the same dimensions. If any of the questions cannot be computed write "cannot compute" and state why those matrices cannot be computed. This worksheet is due one week from today. If the entire worksheet is complete you will receive five extra credit points.

$$a = \begin{vmatrix} 5 & 2 \\ 4 & 8 \end{vmatrix} \qquad b = \begin{vmatrix} -1 & 4 & 9 \\ 13 & 34 & 26 \end{vmatrix} \qquad c = \begin{vmatrix} -7 & 3 \\ 11 & 6 \end{vmatrix} \qquad d = \begin{vmatrix} 19 & 45 & 76 & 33 \end{vmatrix}$$

$$e = \begin{vmatrix} 0 & 31 & 55 \\ 2 & -9 & 83 \end{vmatrix} \qquad f = \begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix} \qquad g = \begin{vmatrix} 89 & 102 & 7 & 39 \end{vmatrix} \qquad h = \begin{vmatrix} 9 & 1 & 8 \\ 2 & 7 & 3 \\ 6 & 4 & 5 \end{vmatrix}$$

Compute the following:

1) $c + a$ 2) $b - e$ 3) $f + g$ 4) $d + g$

5) $h - b$ 6) $g - d$ 7) $h - f$ 8) $a + c$

9) $h + f$ 10) $e + h$ 11) $g + d$ 12) $e - b$

13) $a - c$

14) $c - a$

15) $e + e$

16) $f + a$

17) $e + b$

18) $a - a$

19) $f + a$

20) $d - g$