Graphing Calculator Basics (TI82, 83, 84, 85, or 86) NAME:

This worksheet will guide you through basic home screen operations and graphing including setting the window configurations. This worksheet will discuss the **ON**, **2nd** , **ALPHA, ^, QUIT, MODE, MATH, x^2**, **Y=**, **WINDOW**, **ZOOM**, **TRACE**, and **GRAPH** buttons. In addition, the **TI85 and 86** calculators have special buttons and menu systems that we will discuss.

1. To turn on your calculator, push the **ON** button in the lower left corner. Your calculator screen will go blank after about 5 minutes of non-use. If this happens, just push **ON** again.

Be aware that there are **2nd** functions and **ALPHA** functions for most of the buttons. For instance the **2nd** function of the **ON** button is **OFF**. So you would push the yellow **2nd** button (it's blue on the **TI82**) then the **ON** button to turn your calculator off. As another example, notice π is the **2nd** function of the ^ button, located above the division button. We'll use this later.

The home screen is where you will do simple calculations. To get to the home screen from another screen, press **EXIT** (**TI85 or 86**) or **QUIT**. Notice the **QUIT** button is the **2nd** function of the **MODE** button on the **TI84, TI82, or TI83**.

A note for TI85 or 86 users: The menu system is quite different than the **TI84, TI82, or TI83**. It contains essentially the same items but the format is different. Instead of menus that scroll down the screen, the menus are situated across the bottom of the screen. To explain this, let's play with the Graphing menus. Press the **GRAPH** button (below the **ALPHA**). A menu appears at the bottom of the screen. Notice there is an arrow to the right of this menu. Press **MORE** to see other options. To select an option, press the **F1** through **F5** buttons. Cycle through the options with the **MORE** button until you get to **ZOOM**. Select it by pressing **F3**. Notice a second set of options (the **ZOOM** menu) appears below the first menu. Use the **F1** through **F5** buttons to access these new options. You can choose the top menu options two different ways: 1.) Press **EXIT** to exit the first menu and then use the **F1** through **F5** keys as normal, or 2.) Press the **2nd** button and then the **F1** through **F5** keys. You'll notice that the second functions of these buttons are labeled **M1** through **M5** (meaning they access the top menus).

2. Start on the home screen. To practice using your calculator, we'll calculate $\frac{3^4+16}{5^2-10}$. You can put it all in your calculator at once, but you must have parentheses around the entire top and the entire bottom. To square the 5, use the **x^2** button located on the left of the calculator. To calculate exponents other than 2, you must use the ^ button. Try this now. *Round your answer to two decimal places. Write your answer down here.*

Did you get 6.47? If you did not, make sure you entered (3 ^ 4 + 16) / (5^2 - 10), then press **ENTER**. Notice the parentheses.

3. A nice function of your calculator is the fraction conversion function. This converts decimal answers to fractions. Let's convert our previous answer 6.47 into a fraction. Press the **MATH** button <u>without</u> clearing your answer from before.

On the **TI84, TI83, or TI82**, the **MATH** button is on the left hand side. You want the first option that looks like **"[triangle] Frac"**. Push **ENTER** to enter **"[triangle] Frac"** onto the home screen.

On the **TI85 or 86**, the **MATH** menu is the second function of the multiplication button. The **"[triangle] Frac"** option is under **MISC** within the **MATH** menu. Once within the **MISC** menu, you need to press the **MORE** button to get to the **"[triangle] Frac"** option. Then press **F1** to select the **"[triangle] Frac"** option.

Below the original answer, the screen should read "**Ans [triangle]Frac**". The "Ans" stands for "Answer" as in the last calculation. Then hit **ENTER** again to have the calculator find the equivalent fraction. *What did you get?*

4. Now let's say we wanted to know the decimal approximation of -2π. Find it on your calculator now. You'll need to use the **2nd** function of the ^ button to get π. You can just enter -2π; you do not need a multiplication sign. Also, make sure you use the negative key, which looks like **(-)** within the gray (white on **TI84**) number pad area, not the minus operation key on the right hand side. *What did you get? Round your answer to two decimal places.*

5. Let's graph $y = 3x + 5$. You'll enter this into the **Y=** editor. The graphing buttons (including **Y=**) are located at the very top of the calculator, right under the screen. This section will show you how to enter things to be graphed and to quickly set your window dimensions.

On the **TI84, TI83, and TI82**, press the little **Y=** button in the upper left of the calculator, right under the screen. To the right of the $\mathbf{Y_1}$**=**, enter 3X + 5. (Pressing the **X,T,**θ**,n** button on the **TI83** or **TI84** and the **X,T,**θ button on the **TI82** enters the X.) Then hit **ZOOM** and select **6:ZStandard**.

On the **TI86 and TI85**, press the **GRAPH** button. It is located beneath the blue-colored **ALPHA** button. Then select **y(x)=** by pressing the little **F1** button below the screen where it says **y(x)=**. Then enter 3x + 5 into the space right of the **y1=** symbol. (Pressing the button **x-VAR** enters the x.) Press **EXIT** to reduce the double row of menus to one row, then select **ZOOM**. Then select **ZSTD**, this stands for **ZoomStandard**.

Notice this gives a graph that uses the *x*-values from -10 to 10 and the *y*-values from -10 to 10. I might write these values as [-10,10]x[-10,10] which denotes the interval of *x*-values and the interval of *y*-values. This is called the **Standard Window**. When graphing, this is a good screen to start with, especially if you do not know where the graph will be and the numbers involved are fairly small.

Copy your graph here. Look at the graph in your calculator and try to plot the x and y intercepts correctly. Draw a few tick marks in each direction and plot the x and y intercepts first. Then connect them to get a nice graph on paper. (Remember you can tell the y-intercept by looking at its equation.)

6. Now let's graph y = 3*x* + 35. Just amend your expression in the **Y=** editor, replacing the 5 at the end of $\mathbf{Y_1}$ with a 35, and hit **GRAPH**. Do this by arrowing over to the 5 with your **arrow keys** and then just replace the 5 with a 35. (On the **TI86 and TI85**, you must press **EXIT** and then press **F5** for **GRAPH**.)

What does your graph look like? What happened?

We'll zoom out to get a better look at the graph.

On the **TI84, TI83, and TI82**, press **ZOOM**, and then select **3:ZOOM OUT**.

On the **TI85 or TI86**, press **F3** for **ZOOM**, and then select **ZOUT**. This stands for **ZOOM OUT**.

It will put a cursor on the screen. You must press **ENTER** again to make it zoom out, with the center of the new screen being where the cursor was. Move the cursor with your **arrow keys** a little before you hit **ENTER** to see what I mean.

Copy your graph quickly here. Do not worry about tick marks. Just get the general shape and angle roughly correct.

7. The **ZOOM OUT** feature can help us get the graph on screen but often you'll want to tweak the screen dimensions to get a better view. We'll change the window (the *x* and *y* values graphed) so that we have a clearer picture of the graph.

On the **TI84, TI83, and TI82**, press **WINDOW**.

On the **TI85 and TI86**, you will need to press **EXIT** to get the menus back on screen, then **EXIT** again to get only one row of menus. Then select **F2** for **RANGE** (**TI85**) or **WIND** (**TI86**).

This gives you a place to enter values for **xmin**, **xmax**, **xscl**, **ymin**, **ymax**, and **yscl**. (Another setting, **xres**, may or may not be available. You can ignore it if it is there.) Enter -20 for **xmin**, 20 for **xmax**, -20 for **ymin**, and 60 for **ymax**. Make sure you are using the **(-)** key in the number pad and not the minus operation key for the negative numbers. The **xscl** and **yscl** tell the calculator how many units each tick mark on the axes will be worth. Set **xscl** and **yscl** both to 10. Use the **arrow keys** to move around the screen.

Then press the **GRAPH** button to make it graph with the new window. Notice how the screen looks, taking into consideration the tick marks on the axes and the *x*-values and *y*-values shown.

Copy the graph here. Draw the tick marks also. Try to plot your x and y intercepts somewhat accurately.

8. The **TRACE** feature is nice to help us see specific points on the graph. It places a cursor on the graph itself and allows us to move along the graph, seeing the points' coordinates as we go. While still on the graph screen of $y = 3x + 35$, press the **TRACE** button. This button is one of the little ones at the top.

Pressing the **TRACE** button should put a cursor on the graph itself. Move the cursor using the **left and right arrows**. As you do so, notice the points' coordinates are shown on the bottom of the screen. This function will allow you to copy graphs quite accurately on paper. If the coordinates do not show up, see the next section of this worksheet.

9. If the coordinates of the points as you traced along the graph were not showing up on the bottom of the screen, do the following.

On the **TI84 and TI83**, press the **2nd** button and then the **ZOOM** button. (The **2nd** function of the **ZOOM** button is the **FORMAT** menu.)

On the **TI82**, press the **WINDOW** button to enter the **WINDOW** screen. Then select the **FORMAT** menu by pressing the **right arrow**.

On the **TI86 and TI85**, start by pressing the **GRAPH** button. Then press the **MORE** button to access the **FORMT** option. Press **F3** to select **FORMT**.

If you did not see the coordinates of the points when tracing, **CoordOff** will be highlighted. Arrow down to the **CoordOn** and press **ENTER** to highlight it. This should correct the problem.

10. Let's investigate the **TRACE** button a little more. Leave $Y_1 = 3X + 35$ in the $\mathbf{Y_1}$ position and enter $Y_2 = -2X + 10$ into the $\mathbf{Y_2}$ spot in the **Y=** editor. The **down arrow** will get you to the $\mathbf{Y_2}$ line. Get to the graph screen and press **TRACE** again. Again, the **left and right arrows** will move the cursor along one graph. The **up and down arrows** will switch between the two graphs. Try this now. Notice the upper left corner (upper right corner on **TI82, 85, or 86**) indicates which function the cursor is on. If there is no indication, see the next section of this worksheet. *Copy the graph screen as it is now. Draw the tick marks also. Try to plot your x and y intercepts somewhat accurately.*

11. While you are tracing along graphs, you will want to know which function your cursor is on ($\mathbf{Y_1}$ or $\mathbf{Y_2}$ or $\mathbf{Y_3}$ or etc.). For the **TI84 or 83**, in the **FORMAT** menu mentioned above, make sure **ExprOn** is highlighted. This is not possible for the **TI86, TI85, or TI82**. On these calculators, you should see a number in the upper right hand corner of the screen referring to the number of the function you are on ($\mathbf{Y_1}$ or $\mathbf{Y_2}$ or $\mathbf{Y_3}$ or etc.). I do not think you can turn this feature off on those calculators.