

Tangent Lines and Derivatives

Name: _____

Per: _____

Date: _____

GETTING READY

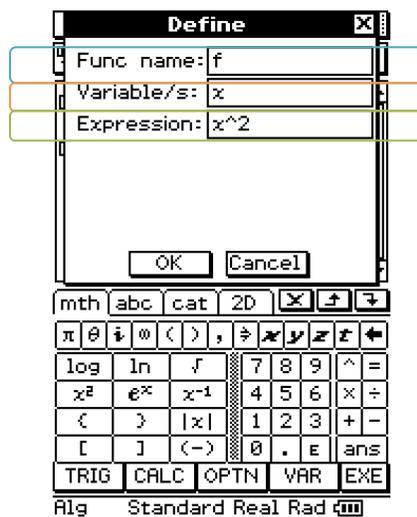
- 1) Open the Main Application (J).
- 2) Select **Edit** and then **Clear All**.
- 3) Select **OK** when prompted with the **Clear All** menu.

SETUP

Define the Function

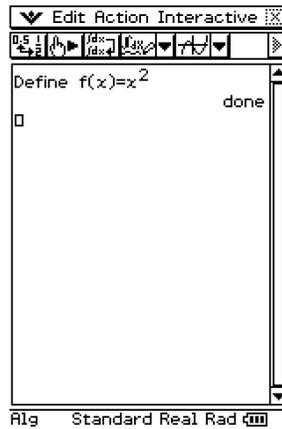
- 1) Tap **Interactive, Define** from the menu bar.
- 2) When the dialog box pops up, **f** is already entered as the function name. Keep that name.
- 3) The variable/s box should already have **x** entered. Keep that variable.
- 4) Enter the expression you want; we will start with x^2 . (Use the Keyboard that opens for you.)

Result:



- 5) Tap **OK**.

Result:



Define the Derivative

1) Tap **Interactive, Define** from the menu bar.

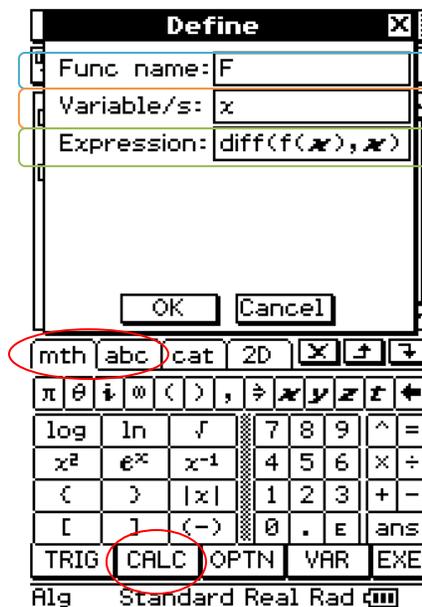
2) Change the function name from **f** to **F** using the Keyboard and the **0** tab.

3) The variable/s box should already have **x** entered. Keep that variable.

4) Enter the expression you want; we will start with **diff(f(x),x)**. You enter **diff** by using the **-** tab on the Keyboard (when you are in the **9** tab). To enter the **f**, you must use the **0** tab.

To enter the rest, you must go back to the **9** tab and then use the **I** button at the bottom.

Result:

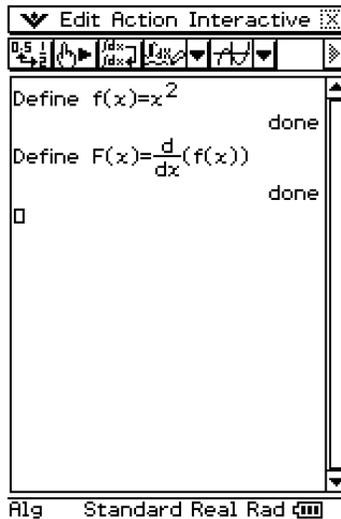


TIP:

We can also type **diff** from the **0** tab in the k .

5) Tap **OK**.

Result:



INVESTIGATION

You will be filling out the following table as you go through the investigation. The first row is already completed for you using the information that follows. You will choose your own x -values to complete it.

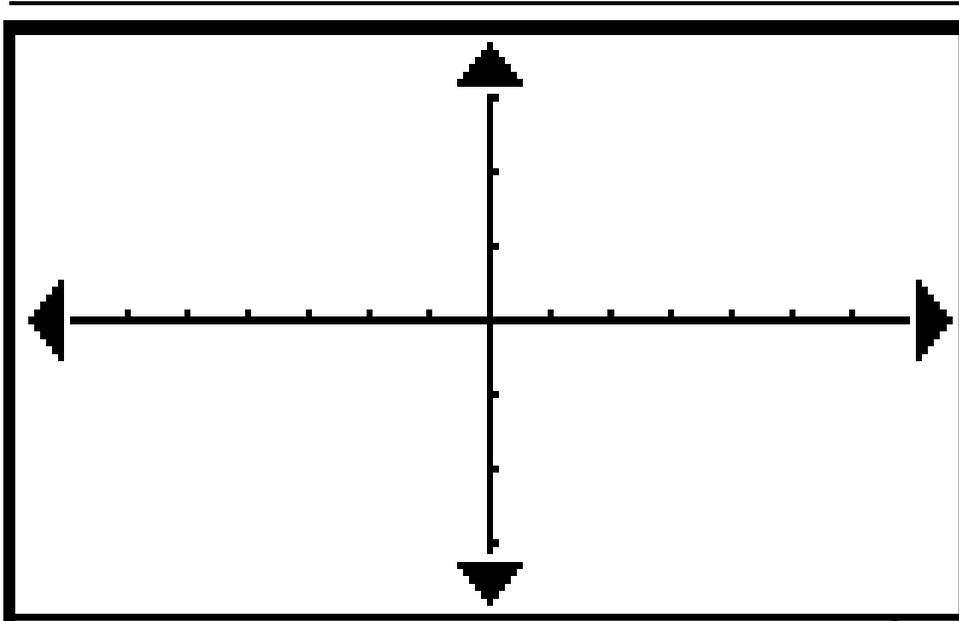
Function: $f(x)=x^2$	x-values	F(x) (value of derivative @ different x-values)	tanLine expression (from calculator)	Slope of Tangent Line
Trial #1	3	6	$6x-9$	6
Trial #2				
Trial #3				
Trial #4				
Trial #5				

You will sketch a graph from one of your trials that include both the original function and the tangent line. Indicate which trial you are graphing. Scale the axes appropriately so your graph fits on the axes. For instance, if I was graphing the example above, I would scale my axes appropriately, write **1** in the **Trial #** space. I would also enter $f(x)=x^2$ for the **function** and $6x-9$ for the **tangent line**. Then I would sketch the graph.

Trial # _____

Function:

Tangent Line:

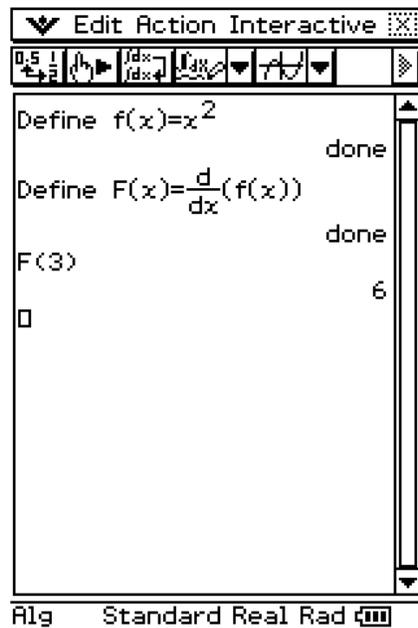


Practice:

1) Evaluate $F(x)$ at $x=3$. (Enter $F(3)$.)

- a) Open your k and select the 0 tab to enter F . Go back to the 9 tab to enter the rest.
- b) Press EXE and close your k .
- c) Record the **x-value** (3) and the $F(x)$ value (6) in the table. (This is entered as an example for you in the table above.)

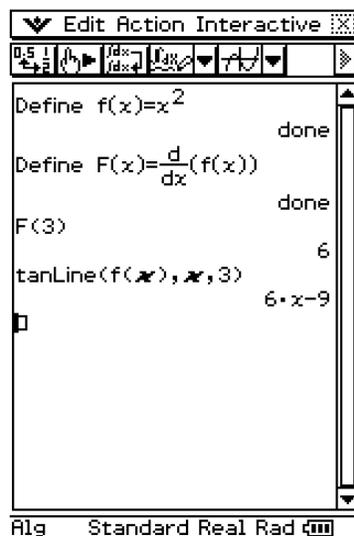
Result:



2) Now you need to calculate the tangent line.

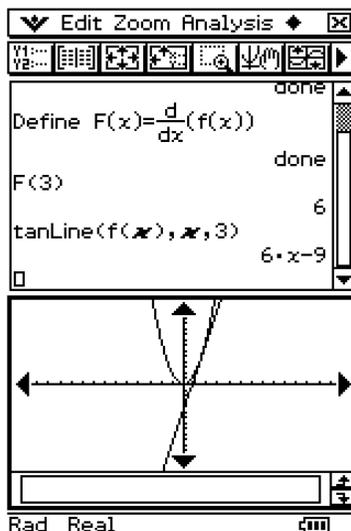
- Tap **Action, Calculation, tanLine**.
- Open your **k** like you did previously, and enter **f(x),x,3**.
- Press **EXE**.
- Record the **tanLine expression** and the **slope of the tangent line** in the table. (This example is already entered for you.)

Result:



- 3) Now tap the \$ button on the right of the toolbar to open the graph window.
- 4) Highlight (by pressing, dragging, and releasing) x^2 . Press on what you've selected, drag, and drop it into the graph window you just opened. The graph of $f(x)=x^2$ will appear in the graph window. (You can select the O symbol in the upper left hand corner in the menu bar and then **View Window** to adjust the window, or tap the 6 button.)
- 5) Now highlight the tangent line expression $6x-9$, and drag and drop it onto the graph window in the same manner as you just did with x^2 .

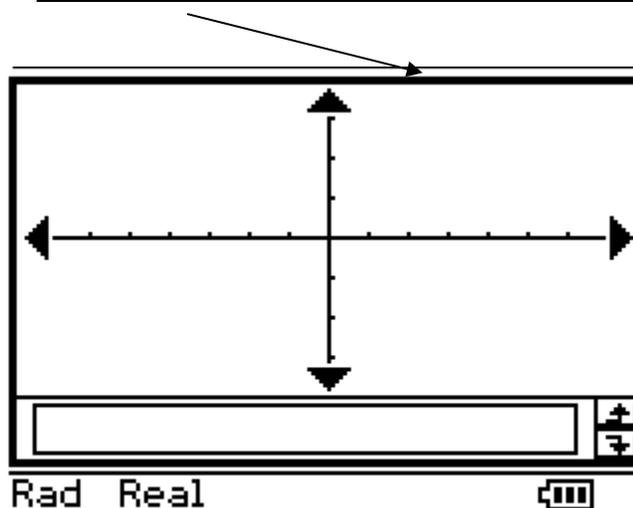
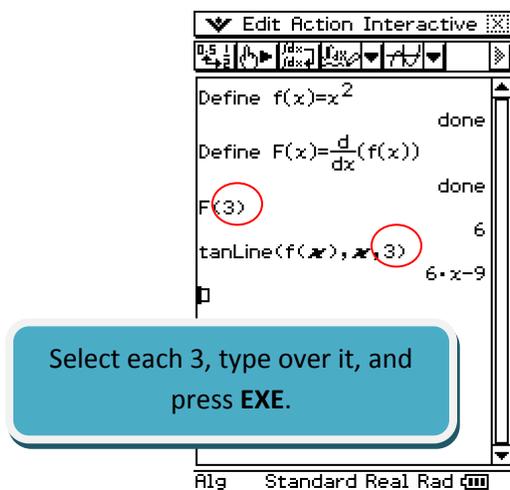
Result with Adjusted Window:



- 6) Now pick your own x-values for trials 2-5. You can keep the expressions you entered in the main window, and just edit the values for x. What you need to change is indicated below. You will also need to clear the graph window. To select the graph window, tap anywhere in the window. (Make sure the graph window is selected and select **Edit, Clear All**. Select **OK** when prompted.) Drag and drop your graphs. **Complete the table for trials 2-5 as you work.**

What to change:

Dark Border Appears when Window is Selected



7) Sketch your chosen graph on the axes provided.

FURTHER INVESTIGATIONS:

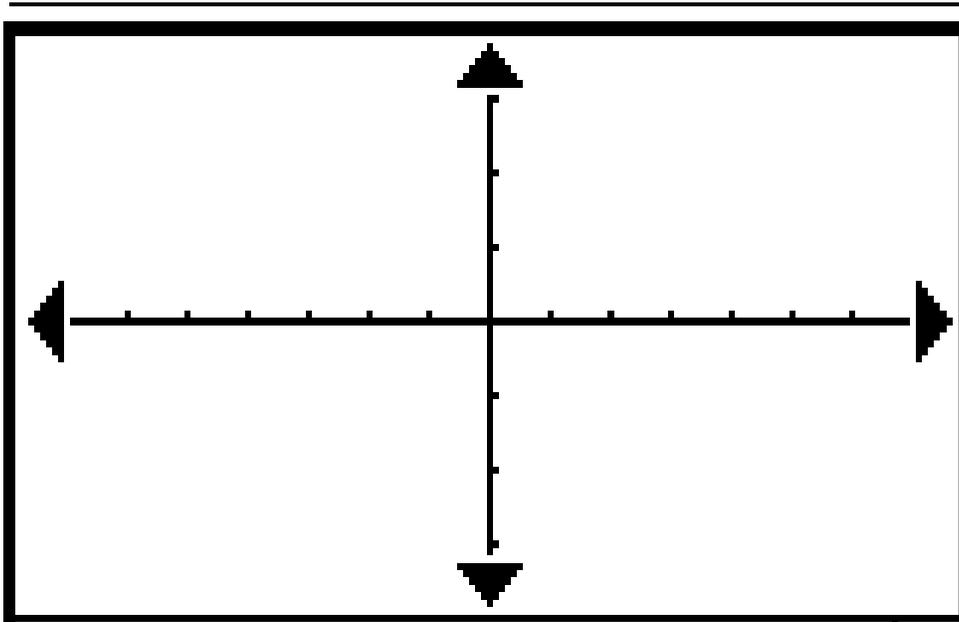
Now modify your original equation in the top line of the ClassPad. Update that in the table below and use the investigation steps above to help you complete this table. You get to choose which x-values you want to explore. Also, pick a trial and sketch the graph. Tables and axes are provided for 3 function investigations.

Function: f(x)=	x-values	F(x) (value of derivative @ different x-values)	tanLine expression (from calculator)	Slope of Tangent Line
Trial #1				
Trial #2				
Trial #3				

Trial # _____

Function:

Tangent Line:

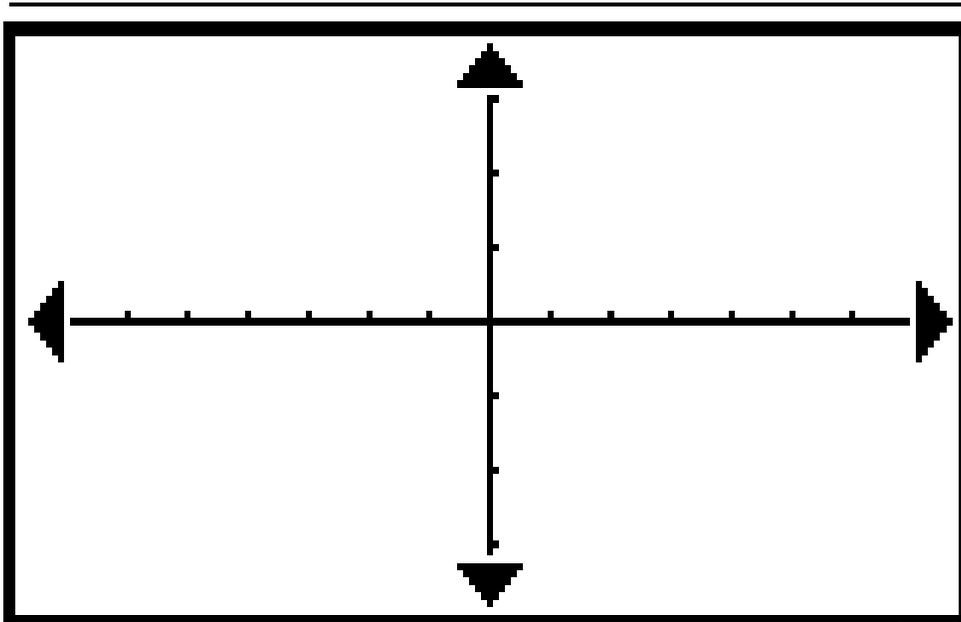


Function: f(x)=	x-values	F(x) (value of derivative @ different x-values)	tanLine expression (from calculator)	Slope of Tangent Line
Trial #1				
Trial #2				
Trial #3				

Trial # _____

Function:

Tangent Line:

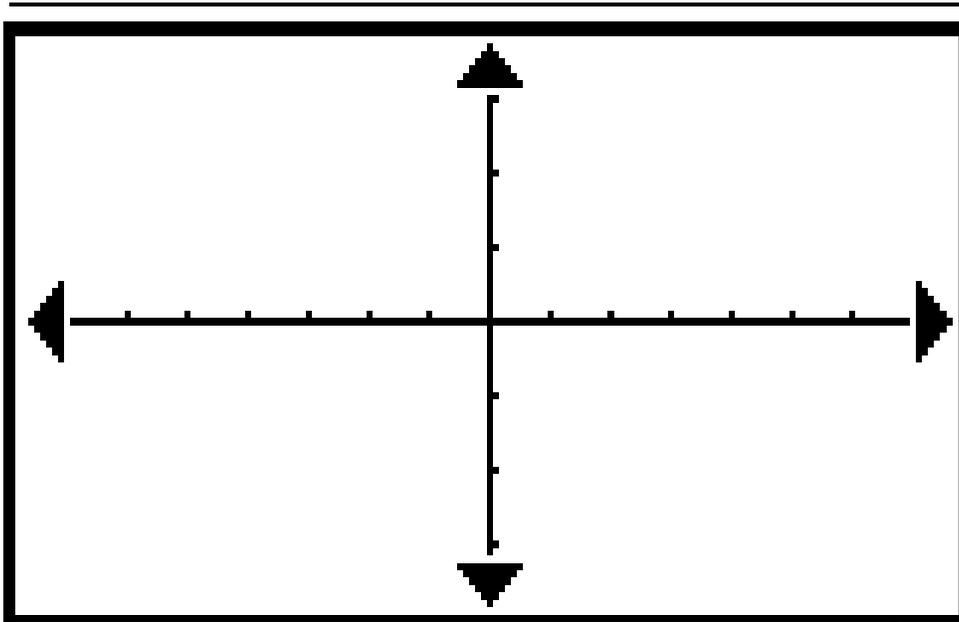


Function: f(x)=	x-values	F(x) (value of derivative @ different x-values)	tanLine expression (from calculator)	Slope of Tangent Line
Trial #1				
Trial #2				
Trial #3				

Trial # _____

Function:

Tangent Line:



QUESTIONS:

1) Look back at the tables you completed. What do you notice about the value of the derivative at a particular value of x and the slope of the tangent line at that same point? Do you think this is the same for any function? Why?

2) What does the slope of the tangent line measure? What does a derivative measure at a particular point? In your own words, define **slope** and **derivative**.

3) If an unknown function has a tangent line at the x -value 7, and that tangent line has a slope of -3, what is the derivative of that function at $x=7$?