

Logs and Exponents

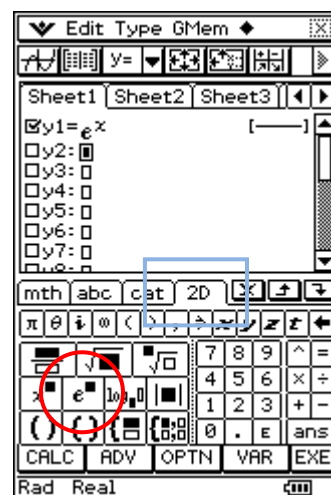
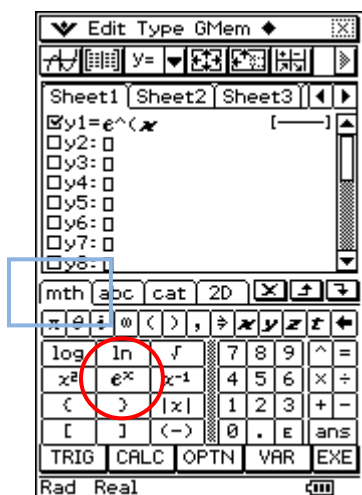
Name _____

In this activity we will discover the derivatives of the functions $f(x) = e^x$ and $g(x) = \ln(x)$.

Exercise 1

Let's start by graphing the function $f(x) = e^x$.

- 1) From the Application Menu, \mathfrak{M} , go to the Graph and Table Application, \mathfrak{G} .
- 2) Next to "y1=" enter e^x . To do this open the Keyboard, in the mth tab tap $\overline{e^x}$ and then x . You can also create a 2D e^x by going to the 2D tab, tapping \mathfrak{Q} , and then tapping x . Once you have an e^x , tap EXE to place a check mark in the box before "y1=" (you can also tap the box to check and uncheck).

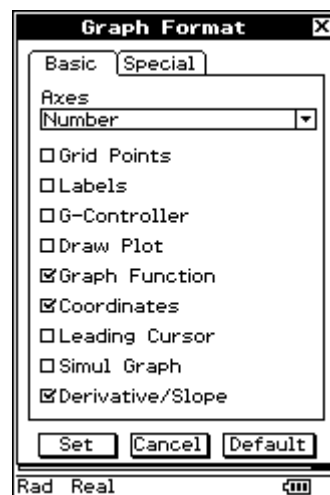


- 3) Tap the \$ button on the left side of the toolbar to graph the equation.

Note: The view window can be adjusted if needed. Go to Zoom in the Menu bar and select Quick Standard.

We want to inspect the derivative at points on our curve. The ClassPad can help!

- 4) Tap the \mathfrak{O} in the Menu bar. Select Graph Format and tap to put a check in the last box labeled Derivative/Slope. Tap the Set button.



- 5) Tap Analysis in the Menu bar and select Trace.

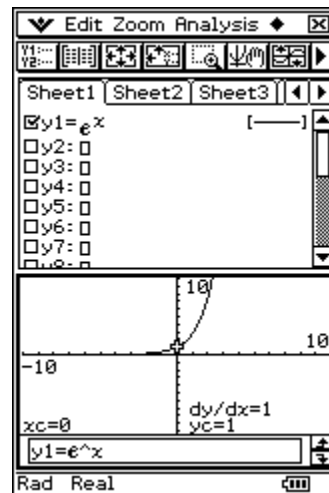
A cursor should be blinking on the graph of e^x . Notice that whatever point the cursor is on, the x coordinate, y coordinate, and dy/dx value for the point is labeled on the graph.

You can scroll back and forth on the graph using the left and right buttons on the ClassPad's Cursor.

You can also enter the x value you would like to go to. A dialog box will pop up if you start entering a number. Be sure to enter an x value between -10 and 10. Tap OK.

- 6) Fill in the following table of values for $f(x) = e^x$.

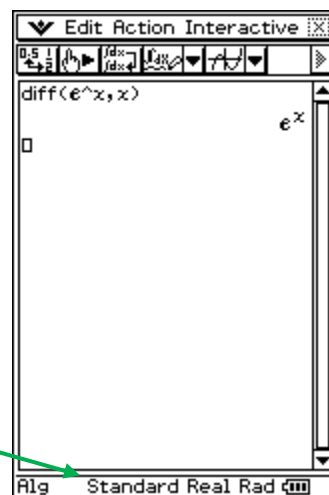
x	$f(x)$	$f'(x)$
-2		
-1		
0	1	1
1		
2		
3		



- 7) Using the table, deduce what the function $f'(x)$ is. $f'(x) = \underline{\hspace{2cm}}$

- 8) We can check our answer in the Main window. Tap M in the Hard Icon Panel.

- 9) The ClassPad can find the derivative of expressions by selecting Action in the Menu bar, Calculation and then diff. With "diff(" in the window, enter the expression you want differentiated (e^x), a comma, the variable you want to differentiate with respect to (x), closed parenthesis. Make sure you are in Standard Mode, and hit EXE. Tapping with the stylus toggles between Decimal and Standard.



We see that the derivative of $f(x) = e^x$ is $f'(x) = e^x$. This is the only function other than the constant zero function that is its own derivative.

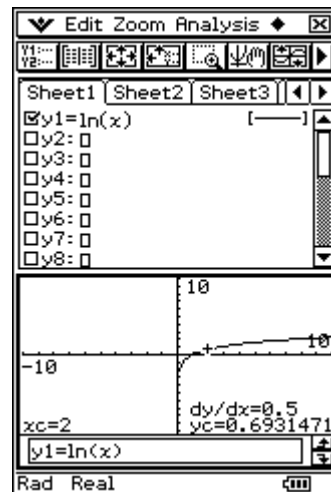
Exercise 2

Let's discover the derivative for $g(x) = \ln(x)$.

Repeat steps 1-3 above to graph the function. "ln" can be found in the mth tab of the Keyboard.

Repeat steps 4-6 to fill out the table:

x	$g(x)$	$g'(x)$
.5		
1		
2	.693	.5
3		
4		
5		



Using the table, deduce what the function $g'(x)$ is. $g'(x) = \underline{\hspace{2cm}}$

Check your answer in the Main window.

Exercise 3

Find the derivatives of the following.

$$h(x) = e^{-x}$$

$$j(x) = \ln(2x)$$

$$k(x) = e^{2x}$$

$$m(x) = 2e^x$$