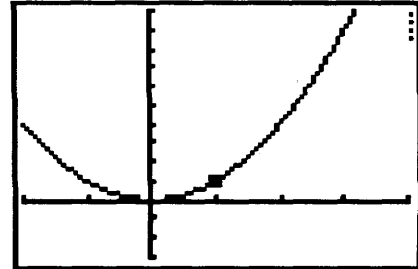


Definition of the Derivative**Lab 5**

1. Run the program DEFDERIV. Press **[ENTER]**.
2. Select **1:ENTER F(X)** and enter the function x^2 . Press **[ENTER]**. Enter **Xmin = -2, Xmax = 4, Ymin = -3, Ymax = 10**. Press **[ENTER]**.
3. Select **3:ENTER X-VALUE** and enter 1 for the x -value. Press **[ENTER]**.
4. Select **4:DRAW SECANT** and enter 2 for the h -value. Press **[ENTER]** to see a graph of the function and the secant line. Sketch the secant line on the graph provided. Press **[ENTER]** and record the slope of the secant line in the table below.
5. Repeat step 4 for each of the h -values in the table.



x -value	h -value	slope
1	2	
1	1	
1	0.5	
1	0.1	

x -value	h -value	slope
1	-2	
1	-1	
1	-0.5	
1	-0.1	

- a. As h approached 0, to what value does the slope appear to approach? _____
 - b. What do the secant lines appear to graphically approach? _____
6. Enter a window of $[-1, 5] \times [-3, 20]$ and repeat for an x -value of 2.

x -value	h -value	slope
2	2	
2	1	
2	0.5	
2	0.1	

x -value	h -value	slope
2	-2	
2	-1	
2	-0.5	
2	-0.1	

- a. As h approached 0, to what value does the slope appear to approach? _____
 - b. What do the secant lines appear to graphically approach? _____
7. Enter a window of $[-2, 3] \times [-1, 8]$ and repeat for an x -value of 0.5.

x -value	h -value	slope
0.5	2	
0.5	1	
0.5	0.5	
0.5	0.1	

x -value	h -value	slope
0.5	-2	
0.5	-1	
0.5	-0.5	
0.5	-0.1	

- a. As h approached 0, to what value does the slope appear to approach? _____
- b. What do the secant lines appear to graphically approach? _____

8. Enter a window of $[-5, 1] \times [-2, 20]$ and repeat for an x -value of -2 .

x -value	h -value	slope
-2	2	
-2	1	
-2	0.5	
-2	0.1	

x -value	h -value	slope
-2	-2	
-2	-1	
-2	-0.5	
-2	-0.1	

- a. As h approached 0, to what value does the slope appear to approach? _____
- b. What do the secant lines appear to graphically approach? _____
9. Compare the values of x to that of the slopes in each part a. What pattern for the value of the slope do you see?

10. If the derivative is defined to be the slope of a line tangent to the graph of f at a point x as well as $\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$, make a conjecture about the exact value of the derivative of f .

$$f'(x) = \underline{\hspace{10em}}$$

11. Repeat for the function $f(x) = x^3$. Enter a window of $[-3, 3] \times [-10, 10]$.

x -value	h -value	slope
1	1	
1	0.1	
1	0.01	

x -value	h -value	slope
1	-1	
1	-0.1	
1	-0.01	

- a. As h approached 0, to what value does the slope appear to approach? _____
- b. What do the secant lines appear to graphically approach? _____

x -value	h -value	slope
0.5	1	
0.5	0.1	
0.5	0.01	

x -value	h -value	slope
0.5	-1	
0.5	-0.1	
0.5	-0.01	

- c. As h approached 0, to what value does the slope appear to approach? _____
- d. What do the secant lines appear to graphically approach? _____

x -value	h -value	slope
-1	1	
-1	0.1	
-1	0.01	

x -value	h -value	slope
-1	-1	
-1	-0.1	
-1	-0.01	

- e. As h approached 0, to what value does the slope appear to approach? _____
- f. What do the secant lines appear to graphically approach? _____
12. Compare the values of x to that of the slopes in parts a, c, and e. Make a conjecture about the exact value of the derivative of $f(x) = x^3$.

$$f'(x) = \underline{\hspace{10em}}$$

13. Repeat for the function $f(x) = x^4$. Enter a window of $[-3, 3] \times [-5, 20]$.

x -value	h -value	slope
1	1	
1	0.1	
1	0.01	

x -value	h -value	slope
1	-1	
1	-0.1	
1	-0.01	

- a. As h approached 0, to what value does the slope appear to approach? _____
- b. What do the secant lines appear to graphically approach? _____

x -value	h -value	slope
0.5	1	
0.5	0.1	
0.5	0.01	

x -value	h -value	slope
0.5	-1	
0.5	-0.1	
0.5	-0.01	

- c. As h approached 0, to what value does the slope appear to approach? _____
- d. What do the secant lines appear to graphically approach? _____

x -value	h -value	slope
-1	1	
-1	0.1	
-1	0.01	

x -value	h -value	slope
-1	-1	
-1	-0.1	
-1	-0.01	

- e. As h approached 0, to what value does the slope appear to approach? _____
- f. What do the secant lines appear to graphically approach? _____

14. Compare the values of x to that of the slopes in parts a, c, and e. Make a conjecture about the exact value of the derivative of $f(x) = x^4$.

$$f'(x) = \underline{\hspace{10cm}}$$

15. Repeat for the function $f(x) = 2x^2$. Enter a window of $[-3, 3] \times [-2, 10]$.

x-value	h-value	slope
1	1	
1	0.1	
1	0.01	

x-value	h-value	slope
1	-1	
1	-0.1	
1	-0.01	

- a. As h approached 0, to what value does the slope appear to approach? _____
 b. What do the secant lines appear to graphically approach? _____

x-value	h-value	slope
0.5	1	
0.5	0.1	
0.5	0.01	

x-value	h-value	slope
0.5	-1	
0.5	-0.1	
0.5	-0.01	

- c. As h approached 0, to what value does the slope appear to approach? _____
 d. What do the secant lines appear to graphically approach? _____

x-value	h-value	slope
-1	1	
-1	0.1	
-1	0.01	

x-value	h-value	slope
-1	-1	
-1	-0.1	
-1	-0.01	

- e. As h approached 0, to what value does the slope appear to approach? _____
 f. What do the secant lines appear to graphically approach? _____

16. Compare the values of x to that of the slopes in parts a, c, and e. Make a conjecture about the exact value of the derivative of $f(x) = 2x^2$.

$$f'(x) = \underline{\hspace{10cm}}$$

17. Given $f(x) = 3x^2 - 2x - 3$, what conjecture can you make about the derivative?

$$f'(x) = \underline{\hspace{10cm}}$$

18. Generalize the pattern found in this lab. If $f(x) = ax^n$, $f'(x) = \underline{\hspace{10cm}}$