

Sign of the Derivative

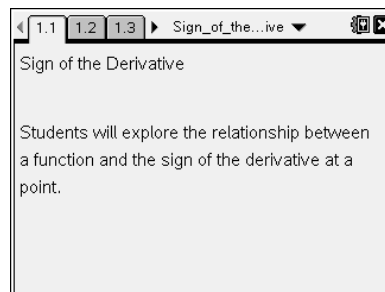
Student Activity

Name _____
Class _____

Open the TI-Nspire document *Sign_of_the_Derivative.tns*.

Objective: To determine when the sign of the derivative of a function is positive, negative, or zero based on looking at the graph of a function.

Directions: Grab the open circle point and move the point from left to right along the function. As you drag the point, observe the sign of the derivative indicated on the screen to answer the questions that follow.



PART I:
Move to page 1.3.

Press (ctrl) ▶ and (ctrl) ◀ to
navigate through the lesson.

For $f(x) = x^2$:

1. Describe the function (increasing, decreasing, minimum, maximum) when the sign of the derivative is positive. For what values of x is the sign of the derivative positive?
2. Describe the function when the sign of the derivative is negative. For what values of x is the sign of the derivative negative?
3. When does the sign of the derivative for the function equal zero? For what value(s) of x is the derivative zero?

Change the function to $f(x) = x^3$. Double-click on the function label and change the exponent to 3.

For $f(x) = x^3$:

4. Describe the function (increasing, decreasing, minimum, maximum) when the sign of the derivative is positive. For what values of x is the sign of the derivative positive?
5. Describe the function when the sign of the derivative is negative. For what values of x is the sign of the derivative negative?

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6. When does the sign of the derivative for the function equal zero? For what value(s) of x is the derivative zero?

Change the function to $f(x) = -x^3$. Double-click on the function label and add a negative sign.

For $f(x) = -x^3$:

7. Describe the function (increasing, decreasing, minimum, maximum) when the sign of the derivative is positive. For what values of x is the sign of the derivative positive?
8. Describe the function when the sign of the derivative is negative. For what values of x is the sign of the derivative negative?
9. When does the sign of the derivative for the function equal zero? For what value(s) of x is the derivative zero?

Generalize your results.

Complete the table for the given functions. Record the x values where the function has the sign of the derivative listed. You may change the graph on your calculator if necessary.

Note: You may have to change the window settings (**Menu > Window > Window Settings**) to find the open circle point.

Function	Sign of the Derivative		
	Positive	Negative	Zero
$f(x) = -x^2$			
$f(x) = -x^2 + 2x$			
$f(x) = x^2 + 3x + 2$			
$f(x) = x^2 - 36$			
$f(x) = 3x^2$			

10. How can you algebraically find the point(s) where the function has a zero for the value of the derivative?

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Part II:

Move to page 2.1.

11. When the sign of the derivative is positive, where does the graph of the derivative lie in the coordinate plane?

12. When the sign of the derivative is negative, where does the graph of the derivative lie in the coordinate plane?

13. When the derivative has a value of zero, where does the graph of the derivative lie in the coordinate plane?

14. Are your answers the same if $f(x) = x^3$? Why or why not?