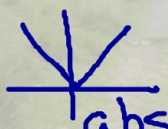
October 2

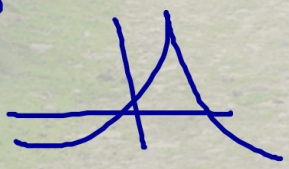
When does a derivative not exist?
(You can give examples of equations or graphs as well as a written description.)

limit is not the same from both sides of the slopes

- corner



- cusp



- discontinuities
- dividing by zero (vertical tangent)

October 2

Students will verbally explain how to use the derivative to give characteristics of a function
(using the words:
increasing, decreasing, positive, negative, zero...)

Xtreme Calculus: Part I

XtremeCalculusPart1.tns

Name _____

Class _____

In this activity, you will explore relative maximums and minimums by dragging a tangent line to a curve and making observations about the slope of the tangent line. Before we start, we need to define *relative maximum*, *relative minimum*, *relative extreme value*, and *critical numbers*. Study these definitions on pages 1.4–1.7.

On page 2.2, drag the tangent line along the given function. To do this, move the cursor towards the point of tangency until a hand and the word 'point' appears. Press and hold the click key ( ) until the hand grabs the point, and use the TouchPad to move the point of tangency along the curve. Observe the slope of the tangent line and determine the critical number(s) of the function.

1. What is (are) the critical number(s) of **f1**(*x*)?

2. What occurs at each of the critical numbers of **f1**(*x*)?

Use the graph on page 2.5 to answer the following questions.

3. What is (are) the critical number(s) of **f2**(*x*)?

4. What occurs at each of the critical numbers of **f2**(*x*)?

Use the graph on page 2.8 to answer the following questions.

5. What is (are) the critical number(s) of **f3**(*x*)?

6. What occurs at the critical numbers of **f3**(*x*)?

7. Does a relative extreme value occur at every critical number? Predict a way to help determine whether or not there is a relative extreme value at a critical number.

Think about how you can tell if a critical number will be at a relative maximum, a relative minimum, or neither. On page 3.3, move the point of tangency along the curve and observe the slope of the tangent line.

8. When the point of tangency is to the left side of the relative maximum, will the slope of the tangent line be positive, negative, or zero?

9. What about when the point of tangency is to the right of the relative maximum?

Repeat this process on page 3.5.

10. For this function, when the point of tangency is to the left side of the relative minimum, will the slope of the tangent line be positive, negative, or zero?

11. What about when the point of tangency is to the right of the relative minimum?

Fill in the blanks of the following sentences.

12. Let f have a critical number at $x = c$. If $f'(x) > 0$ on an open interval extending left from c, and $f'(x) < 0$ on an open interval extending from right of c, then f has a _____at $x = c$.

13. Let f have a critical number at $x = c$. If $f'(x) < 0$ on an open interval extending left from c, and $f'(x) > 0$ on an open interval extending from right of c, then f has a _____at $x = c$.

14. Let f have a critical number at $x = c$. If $f'(x)$ has the same sign on an open interval extending left from c and on an open interval extending right from c, then f has a _____at $x = c$.

Extension

15. How many relative extrema can an nth degree polynomial have? Explain.