Math 4 Honors Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Lesson 6-5: *Using Derivatives to Analyze Graphs* Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Learning Goals:**

* *I can use derivatives and their graphs to identify properties of functions.*
* *I can determine properties of derivatives from the graph of a function.*

I. Throughout this course as well as your previous math courses, you have learned about several key characteristics used to describe the graph of a function.

1. Brainstorm with your group members what these characteristics are & list them below.
2. Describe how you would identify the characteristics by looking at the graph of the function.
3. Describe how you would identify the characteristics from the function rule.
4. Based on what you know about the derivative thus far, what characteristics can be identified using the derivative? How would you identify them?

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II. The following passages come from a calculus textbook and address the characteristics you listed on the

front of this page as well as some new ones. ON YOUR OWN, read the paragraphs carefully and make any notes you feel necessary. Answer the questions as you go along.



What is meant by “more negative”?

 What is meant by “less negative”?

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What is the difference between a *relative* max or min and an *absolute* max or min?

 Can a cubic polynomial have an absolute maximum? Explain.

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 Page 4



 **Write a “newspaper description” of graph II.**



 







 If a graph is concave up, where are the tangent lines?

 If a graph is concave down, where are the tangent lines?

 What is significant about the point of inflection?

**Example:** Use the terms defined in the previous reading Page 5

 to describe the function in Figure 12.

III. The next section addresses what are called the First and Second Derivative Rules. Again, ON YOUR OWN, read the paragraphs carefully and make any notes you feel necessary. Answer the questions as you go along.





 Describe in your own words, what this rule lets us find out about the graph of a function.

 Does this rule apply when the derivative is equal to zero? Explain.

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Describe in your own words, what this rule lets us find out about the graph of a function.

 What is the significance when ?

Complete the following table. Use #1 as your guide.



 2.



 3.



 4.

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*f*(*x*)

 *x*





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**HOMEWORK: Day 1 Assignment - Complete all problems on this page.** Page 8









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20. Using vocabulary from this lesson, describe the graph below with as much detail as possible.



**HOMEWORK** Page 9

**Day 2 Assignment: Complete both sides of this page.**

1.  *Show all work for the following. NO CALCULATOR UNTIL PART e!*

a. Find . Determine the intervals on which *f*  is increasing & decreasing. *Hint: NLA!*

b. Use your *NLA* to determine the coordinates of the relative maximum and relative minimum.

 c. Find . Determine the intervals on which *f*  is concave up & concave down. *Hint: NLA!*

d. Use your *NLA* to determine the coordinates of the point(s) of inflection.

 e. Check your answers to parts a – d using your calculator. (You do not have to sketch the graph.)

 **Sketch & label the graph of the function that has the properties described.**

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**Exercises 35 – 43 refer to Figure 15, which contains the graph of**  **, the derivative of the function** .





 **43.** Suppose  What is the equation of the tangent line to the graph of  at the point (4, 1)?