Worksheet 6

Fall 2016

MATH 221

Name: _____

1

Write down the definition of derivative in 2 (obviously equivalent) ways. Can you think of any time where one of these definitions could be easier to work with than the other?

2

Differentiate the following with the definition of derivative. That is, find and justify $f'(x)$ for each of the following

(a)
$$f(x) = x$$

(b)
$$f(x) = ax, a \in \mathbb{R}$$

(c)
$$f(x) = x^2$$

(d)
$$f(x) = \frac{1}{x}, x \neq 0$$

(e)
$$f(x) = \sqrt{x}$$

(f)
$$f(x) = \sqrt[3]{x}$$

(g)
$$f(x) = 3x^3 - 2x + 1$$

(h)
$$f(x) = \frac{1}{x^3}, x \neq 0$$

3

Find a family numbers a and b so that the following function is continuous. So this answer will be like an equation that a and b have to satisfy.

$$f(x) = \begin{cases} ax + b & : x \leq 0 \\ bx^2 + a & : x > 0 \end{cases}$$

Are there any numbers a and b so that this function is continuous AND differentiable? If so, what are they? If not, why not?

4 To think about

Draw some curves that have maxima and minima. Draw their tangent lines at those points. Look at the geometry there. What is true at these points? Look at your answers to part 2. What are some potential maxima and minima of these functions? Can you find any? How could you use this in an applied setting?