

Math 1161: Written Homework 3

Name: _____ .# _____

Due October 2, 2018 in recitation.

TA: _____ Time: _____

Instructions. You may discuss this assignment with others, but you must submit your own write-up. Write clearly and legibly. All functions herein are real-valued functions of a single real variable.

1. The **image** of a function is the set of y -values that the function takes on at some point in its domain. For example the image of the function x^2 is the interval $[0, \infty)$ and the image of the function $\sin x$ is the interval $[-1, 1]$. Let

$$f(x) = \frac{1}{1+x^2}, \quad x \geq 0.$$

- (a) (3 pts) What is the image the function f above with domain $[0, \infty)$?

- (b) (6 pts) Find a formula for $f^{-1}(x)$ if $f(x) = \frac{1}{1+x^2}$ with domain $[0, \infty)$. (*Hint: Use the quadratic equation and be sure to chose the correct root*). What is the domain of f^{-1} ?

(continued on reverse)

(c) Compute the derivative of f^{-1} in two ways:

i. (3 pts) Find $\frac{d}{dx}f^{-1}(x)$ by differentiating your formula from part (b)

ii. (3 pts) Use the inverse function derivative formula to compute $\frac{d}{dx}f^{-1}(x)$.

iii. (3 pts) Verify that your answers agree.

2. (2 pts) Compute the derivative

$$\frac{d}{dx} \left(\frac{(x^4 + 1)^{5x}}{(6x - 5)} \right)$$

using any method you like. Do not simplify.