

Math 141 - Calculus I - Fall 2017

Quiz 1

September 12, 2017

Name: Solutions

Directions: No calculators or use of Mathematica is allowed on this quiz. There are 3 questions, two on the front, one on the back. Please show all of your work. Unsupported answers will receive no credit. You have 15 minutes. Good luck!

4 **Problem 1.** Is the function $f(x) = \frac{x}{x^2+4}$ an even function, odd function, or neither?

$$f(-x) = \frac{-x}{(-x)^2+4} = \frac{-x}{x^2+4} = -f(x)$$

odd

4 **Problem 2.** Let $f(x) = x^2 - 4$, $g(x) = \sqrt{x}$, and $h(x) = \frac{1}{x}$. Compute the composite function $(h \circ g \circ f)(x)$.

$$(g \circ f)(x) = \sqrt{x^2 - 4}$$

$$(h \circ g \circ f)(x) = \frac{1}{\sqrt{x^2 - 4}}$$

Problem 3.

2 (a) Write the two forms of the difference quotient for a function $f(x)$.

$$i) \frac{f(x+h) - f(x)}{h}$$

$$ii) \frac{f(x) - f(a)}{x - a}$$

5 (b) Compute and simplify the difference quotient for the function $f(x) = \frac{1}{x^2}$. You may use either form of the difference quotient.

$$i) \frac{\frac{1}{(x+h)^2} - \frac{1}{x^2}}{h} = \frac{\frac{x^2}{x^2(x+h)^2} - \frac{(x+h)^2}{x^2(x+h)^2}}{h} = \frac{\cancel{x^2} - x^2 - 2hx - h^2}{x^2(x+h)^2 h}$$

$$= \frac{-2hx - h^2}{x^2(x+h)^2} = \frac{-2x - h}{x^2(x+h)^2}$$

$$ii) \frac{\frac{1}{x^2} - \frac{1}{a^2}}{x-a} = \frac{\frac{a^2}{a^2x^2} - \frac{x^2}{a^2x^2}}{x-a} = \frac{\frac{a^2 - x^2}{a^2x^2}}{x-a} = \frac{\overset{-1}{(a-x)}(a+x)}{a^2x^2 \cancel{x-a}}$$

$$= \frac{-(a+x)}{a^2x^2}$$