

WORKSHEET 1

Math 408C Review

1. Let $g: \mathbb{R} \rightarrow \mathbb{R}$ be a function. What does it mean for g to be differentiable?
2. Using the definition of the derivative, compute $g'(x)$ if $g(x) = 2x^2 - 2$.
3. Give an example of a function which is continuous but not differentiable.
4. Let $h: [a, b] \rightarrow \mathbb{R}$ be a real-valued function on the closed interval $[a, b]$. Define the definite integral

$$\int_a^b h(x) dx.$$

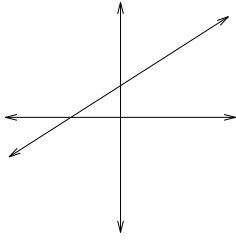
5.
 - a) State the Fundamental Theorem of Calculus (either version).
 - b) What makes this theorem beautiful, powerful, or useful?
 - c) Outline reasoning to believe the Fundamental Theorem of Calculus. A complete proof is not necessary.
6.
 - a) Find

$$\frac{\partial}{\partial x} \int_{-5}^{x^2} \frac{1}{\sec^2 t + t} dt.$$

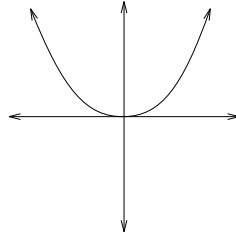
- b) Give another function with the same derivative as the one computed in part a).
7. Give an example of a function that is not integrable.

8. In each part below, you are given the graph of the derivative f' of some function f . Sketch a graph of f satisfying the condition listed.

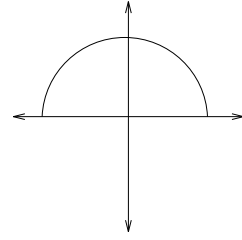
a) $f(0) = 0$



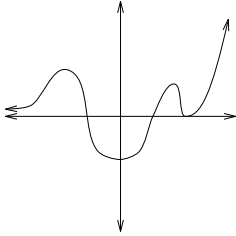
b) $f(0) = 0$



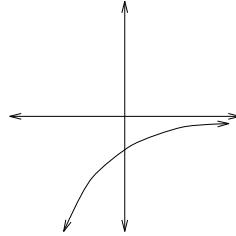
c) $f(1) = 1$



d) $\min(f(x)) = 0$



e) $\lim_{x \rightarrow \infty} f(x) = 2$



f) $\lim_{x \rightarrow 0} f(x) = -1$

