

Calculus I, Chapter 3 Exam

Fall 2018

- **You may not collaborate on this exam; do not work with others.**
 - This exam is open notes, open book. This exam is untimed, but unless I hear otherwise, I expect you to finish by 4:00pm on Wednesday November 14, 2018.
 - When you are done with the exam, give it to me or put it under my door. Please don't put it my mailbox.
 - To receive full credit on most of these problems you must show your work clearly. You can check your work with a computer, but you need to make your calculational methods clear.
1. Let $f(10) = 5$, $g(10) = 3$, $f(4) = 2$, $g(4) = 10$, $f'(10) = \frac{1}{3}$, $g'(10) = 4$, $f'(4) = 7$, $g'(4) = -4$. If $h(x) = 2f(x)g(x)$, and $w(x) = f(g(x))$.
 - (a) Find $h(10)$.
 - (b) Find $h'(10)$.
 - (c) Find $w(4)$.
 - (d) Find $w'(4)$.
 2. Find the derivative of the following functions:
 - (a) $f(x) = 613 + (5 - 3x^2)^{69}$
 - (b) $f(x) = \frac{e^{2x}}{(1-x)^2}$
 - (c) $f(x) = 2^x \cos(3x)$
 - (d) $f(x) = \sqrt{3x + \cos(3x)}$
 - (e) $f(x) = \frac{3}{x^2} + 7 + 2 \ln(3x)$
 - (f) $f(x) = e^{-5x^2}$
 3.
 - (a) What is the 523rd derivative of $g(x) = 17x^{42}$?
 - (b) What is the 44th derivative of $h(x) = \sin(x)$?
 - (c) What is the 25th derivative of $f(x) = e^{3x}$?
 4. Find the local linearization of $f(x) = \ln(1 + 5x)$ at $x = 0$.
 5. Let $g(x) = x^3 - 3x^2 + 17$.
 - (a) Find and classify all critical points of $g(x)$. Determine x and y values exactly. Don't just estimate them from a graph.
 - (b) For what values of x is $g(x)$ concave down? Solve for x exactly—don't just look at a graph and approximate the answer.