

Calculus I, Exam 2

Fall 2010

- **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 5:00 pm Friday November 19, 2010.
- 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 sage if you want, 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 $w(x) = f(g(x))$.

- Find $h(10)$.
- Find $h'(10)$.
- Find $w(4)$.
- Find $w'(4)$.

2. Find the derivative of the following functions:

- $f(x) = 613 + (3x^4 - 5)^{69}$
- $f(x) = \sin(\pi x^2)$
- $f(x) = \frac{e^{2x}}{(1-x)^2}$
- $f(x) = 3^x \cos(2x)$
- $f(x) = \sqrt{3x + \cos(4x)}$
- $f(x) = \frac{3}{x^2} + 7 + 2 \ln(3x)$
- $f(x) = e^{-5x^2}$

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. Let $g(x) = x^3 - 3x^2 + 17$.

- Find and classify all critical points of $g(x)$. Determine x and y values exactly. Don't just estimate them from a graph.
- 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.