

# Calculus I, Exam 2

Fall 2006

- **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 17.
  - 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 Maple 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  $w(x) = f(g(x))$ .
    - (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)  $f(x) = 99 + (x + 4)^{50}$
    - (b)  $f(x) = \sin(x^2)$
    - (c)  $f(x) = \frac{e^{2x}}{(1-x)^2}$
    - (d)  $f(x) = 3^x \cos(2x)$
    - (e)  $f(x) = \sqrt{3x + \cos(4x)}$
    - (f)  $f(x) = x^2 + 3 + 2 \ln(3x)$
  3.
    - (a) What is the 523<sup>rd</sup> derivative of  $g(x) = 17x^{42}$ ?
    - (b) What is the 44<sup>th</sup> derivative of  $h(x) = \sin(x)$ ?
    - (c) What is the 25<sup>th</sup> derivative of  $f(x) = e^{3x}$ ?
  4. Let  $g(x) = x^3 - 3x^2 + 17$ . Determine the equation of the line that is tangent to  $g(x)$  at  $x = 2$ .
  5. Consider  $f(x) = 3x^2 - 2x + 1$ . Find all critical points of  $f(x)$ , and classify (minimum, maximum, neither). Be sure to find the  $y$ -coordinate in addition to the  $x$ -coordinate for the critical points.