

## Exam 2

### Calculus I

College of the Atlantic. Fall 2014

- **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 noon, Thursday November 20, 2014.
  - 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 wolframalpha if you want, but you need to make your calculational methods clear.
1. Let  $f(10) = 5$ ,  $g(10) = 3$ ,  $f(4) = 2$ ,  $g(4) = 10$ ,  $f'(10) = \frac{1}{2}$ ,  $g'(10) = 4$ ,  $f'(4) = -4$ ,  $g'(4) = -4$ . 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)  $f(x) = 42 + (3x^4 - 5)^{69}$
    - (b)  $f(x) = \sin(\pi x^2)$
    - (c)  $f(x) = \frac{(1-x)^{3/2}}{\cos(2x)}$
    - (d)  $f(x) = 4^x \cos(3x)$
    - (e)  $f(x) = \sqrt{3x + \cos(4x)}$
    - (f)  $f(x) = \frac{3}{x^2} + 7 + 2 \ln(3x)$
    - (g)  $f(x) = \sin(e^{-x}x^2)$
  3.
    - (a) Find the local linearization of  $f(x) = \sin(x)$  at  $x = 0$ .
    - (b) Use the local linearization to estimate  $\sin(0.2)$ .
  4. Let  $g(x) = e^{-6x^2}$ .
    - (a) Find and classify all critical points of  $g(x)$ . Solve for  $x$  exactly and show your work—don't just look at a graph and approximate the answer.
    - (b) Find all inflection points of  $g(x)$ . Solve for  $x$  exactly and show your work—don't just look at a graph and approximate the answer.