

**Extra-Credit Take-Home Quiz: Due Tue, Dec 6**

Name: \_\_\_\_\_

Recitation: R02 R03 R04

- You may consult your textbook, notes, and course materials, and you may use a calculator or a computer program for computations.
  - Please work on the problems on your own and do not discuss them with other people. You may ask the instructor or TAs for help or clarifications on the problems, however.
1. Let  $f(x) = \frac{1}{3}x^3 - 3x^2 + 5x + 10$ .
    - (a) Find  $f'(x)$ , and use it to find the critical points of  $f(x)$ .

- (b) Find the global maximum and minimum values of  $f(x)$  on the interval  $[0, 9]$  and the  $x$ -values where they occur.

2. We sell cups of hot chocolate on a cold winter's day. We know that to sell  $q$  cups in a day, we must set the price at  $p(q) = 4 - \frac{1}{2000}q$  dollars.

(a) Use this price function to find the revenue function  $R(q)$  in terms of  $q$ .

(b) Find the marginal revenue in terms of  $q$ . What value of  $q$  maximizes the revenue? What are the price and the revenue at this  $q$ ?

To be profitable, we also need to take into account our costs. It costs us \$200 per day to operate plus \$2 per cup of hot chocolate, so the cost function is  $C(q) = 200 + 2q$ .

(c) Find the value of  $q$  that maximizes our profit. What is the price at that  $q$ , and what profit do we make?