MATH 112
Exam I
Spring 2016

Name _____

Student ID #_____ Section _____

HONOR STATEMENT

"I affirm that my work upholds the highest standards of honesty and academic integrity at the University of Washington, and that I have neither given nor received any unauthorized assistance on this exam."

SIGNATURE:_____

1	14	
2	16	
3	8	
4	12	
Total	50	

- Check that your exam contains 4 problems.
- You are allowed to use a scientific (non-graphing) calculator, a ruler, and one sheet of hand-written notes. All other sources are forbidden.
- Do not use scratch paper. If you need more room, use the back of the page and indicate to the grader you have done so.
- Turn your cell phone OFF and put it away for the duration of the exam.
- You may not listen to headphones or earbuds during the exam.
- You must show your work. Clearly label lines and points that you are using and show all calculations. The correct answer with no supporting work may result in no credit.
- If you use a guess-and-check method when an algebraic method is available, you may not receive full credit.
- When rounding is necessary, you may round your final answer to two digits after the decimal.
- There are multiple versions of the exam, you have signed an honor statement, and cheating is a hassle for everyone involved. DO NOT CHEAT.
- Put your name on your sheet of notes and turn it in with the exam.

GOOD LUCK!

1. (14 points)

   (a) Compute the derivative. DO NOT SIMPLIFY. Put a box around your answer.

   i. $y = \dfrac{(4x^2 - 3x)^{10}(1-x)^{21}}{8}$

   ii. $s(t) = \dfrac{1}{(2t)^7} - \dfrac{3}{5t^3}$

   (b) i. Compute the slope of the line tangent to $y = \dfrac{4x^5 - 2x - 1}{10 - x^2}$ at $x = 0$.

   ANSWER: slope = _____

   ii. Write the equation of the tangent line to the graph of $y = \dfrac{4x^5 - 2x - 1}{10 - x^2}$ at $x = 0$. Put your answer in the form $y = mx + b$.

   ANSWER: $y =$_____

2. (16 points) You sell Things. The formulas for total revenue and total cost are given by:

$$TR(q) = -2.5q^2 + 9800q \text{ and } TC(q) = q^3 - 121q^2 + 4904q + 100{,}000.$$

TR and TC are given in dollars and quantity q is in Things.

(a) Find the longest interval on which **marginal revenue** is **positive**.

ANSWER: from $q =$_____ to $q =$_____ Things

(b) Find the longest interval on which **profit** is **increasing**.

ANSWER: from $q =$_____ to $q =$_____ Things

(c) What is the **maximum possible profit**?

ANSWER: _____ dollars

(d) Find all quantities at which the graph of **marginal profit** has a **horizontal tangent line**.

ANSWER: (list all) $q =$_____ Things

3. (8 points) There is a function $f(x)$ whose formula you do not know. You know that

$$f(a+h) - f(a) = 6ah + 3h^2 - 12h.$$

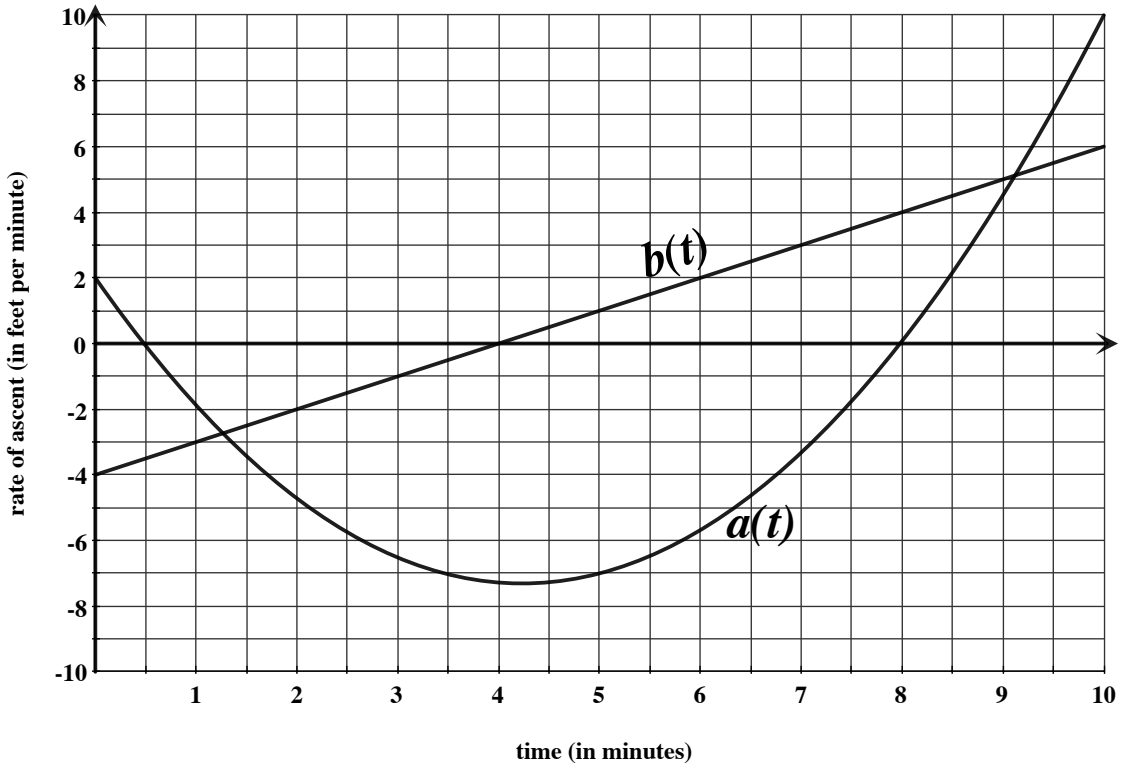
(a) Find the average rate of change of $f(x)$ from $x = 5$ to $x = 5.001$.
(Give at least three digits after the decimal in your final answer.)

ANSWER: _____

(b) Find the value of a at which $f'(a) = 18$.

ANSWER: $a =$_____

4. (12 points) Anita and Bernard are riding in hot-air balloons. At $t = 0$, they are both 250 feet above the ground. Anita's **instantaneous rate of ascent** at time t is given by the function $a(t)$ and Bernardo's **instantaneous rate of ascent** at time t is given by the function $b(t)$. These graphs are shown below.



For each of the following, give a **one-minute interval** during which the listed situation is occurring. If there is no such interval, circle NONE.

You do not need to show any work for this question.

(a) Bernard's balloon is falling

ANSWER: from $t =$_____ to $t =$_____ or NONE

(b) Anita's balloon is falling and getting slower

ANSWER: from $t =$_____ to $t =$_____ or NONE

(c) both balloons are falling

ANSWER: from $t =$_____ to $t =$_____ or NONE

(d) both balloons are rising and getting slower

ANSWER: from $t =$_____ to $t =$_____ or NONE

(e) the balloons are getting farther apart

ANSWER: from $t =$_____ to $t =$_____ or NONE

(f) both balloons are rising and Bernard's is rising faster than Anita's

ANSWER: from $t =$_____ to $t =$_____ or NONE