

MATH 112
Exam I
Spring 2015

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	12	
2	12	
3	14	
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!

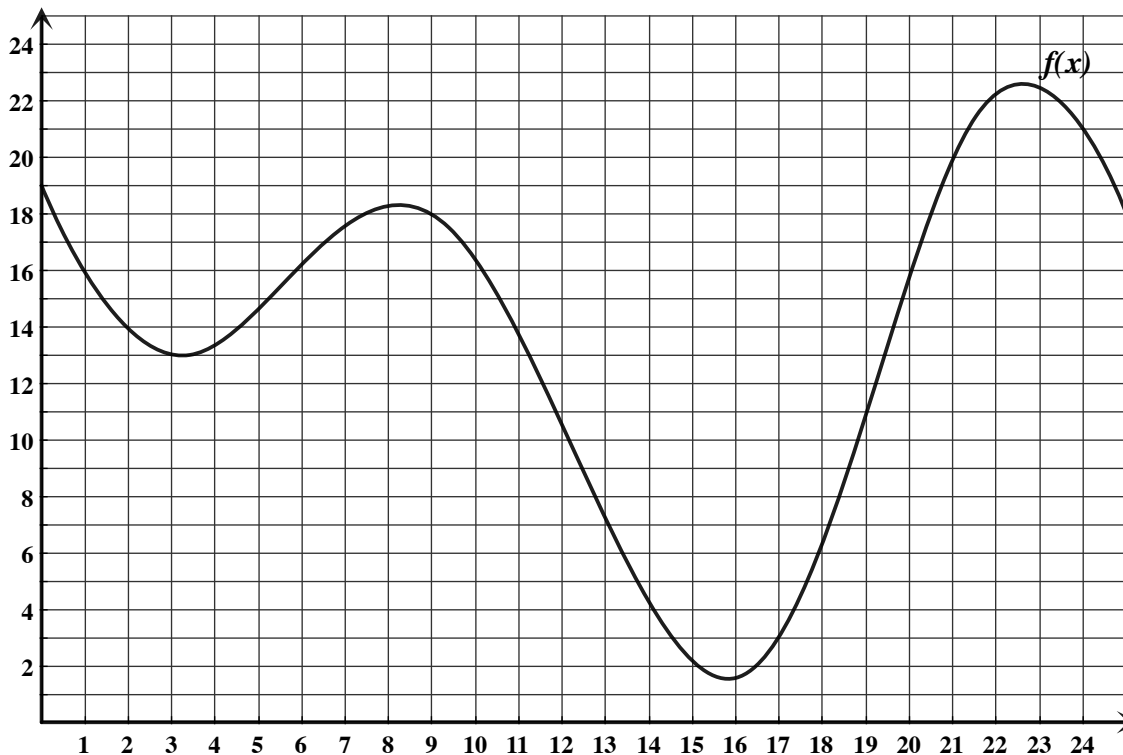
1. (12 points) Compute the derivative. DO NOT SIMPLIFY.

(a) $s = \sqrt{t^5} \left(4t^7 - \frac{1}{t^4} \right)^3$

(b) $y = \frac{7}{3(2x^3 + x)^5} + \frac{8(2x^3 + x)^5}{11}$

(c) $z = \left(\frac{w^3 + 3w + 10}{w} \right)^{15}$

2. (12 points) The graph below shows the function $y = f(x)$.



(a) Approximate $\frac{f(7+h) - f(7)}{h}$ if $h = 0.001$.

ANSWER: $\frac{f(7+h) - f(7)}{h} \approx$ _____

(b) Find a value of a (other than 15) at which $f'(a) = f'(15)$.

ANSWER: $a =$ _____

(c) Give an interval of length 5 on which $f'(x)$ is *negative*. If there is no such interval, circle NONE.

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

(d) Give an interval on which the graph of $f'(x)$ looks like this:



If there is no such interval, circle NONE.

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

3. (14 points) Two moving Objects, a Red Object and a Blue Object, begin from the same location at $t = 0$. After t minutes, the Red Object is $R(t)$ feet from its starting location and the Blue Object is $B(t)$ feet from its starting location, and these are given by the formulas:

$$R(t) = 2t^2 + 6t \quad \text{and} \quad B(t) = -4t^2 + 159t.$$

- (a) Find a formula for the average speed of the Red Object from $t = a$ to $t = a + h$. Simplify your formula as much as possible. Place a box around your final answer.
- (b) Find a time at which the Red Object's **instantaneous speed** is the same as the **average speed** of the Blue Object from $t = 3$ to $t = 7$.

ANSWER: $t =$ _____ minutes

- (c) During what interval of time is the Blue Object traveling faster than the Red Object?

ANSWER: from $t =$ _____ to $t =$ _____ minutes

- (d) How far apart are the Objects and how fast are they traveling when they have the same instantaneous speed?

ANSWER: They are _____ ft apart, traveling at a rate of _____ ft per min.

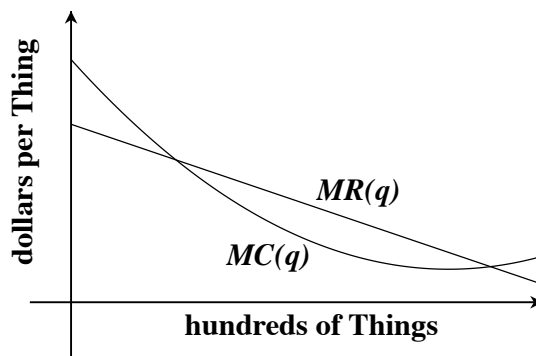
4. (12 points)

You sell Things. The formulas for marginal revenue and marginal cost at q **hundred** Things are given by:

$$MR(q) = -0.85q + 10.5 \quad \text{and}$$

$$MC(q) = 0.25q^2 - 3.6q + 15.$$

Their graphs are given at right.



(a) Give the longest interval on which profit is increasing.

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

(b) Find the quantity at which total revenue is largest.

ANSWER: $q =$ _____ hundred Things

(c) Approximate the change in total cost if production increases from 900 to 901 Things. Include units.

ANSWER: _____ UNITS: _____

(d) Find the quantity at which $TC''(q) = 0$.

ANSWER: $q =$ _____ hundred Things