NAME:___

QUIZ Section: _____

STUDENT ID: _____

Math 112 Midterm 2 Winter 2016

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:_____

- Do not open the test until instructed to do so. Please turn your cell phone OFF now.
- This exam consists of this cover sheet followed by five problems on five pages. When the test starts, check that you have a complete exam.
- This exam is closed book. You may use one double-sided, handwritten $8\frac{1}{2} \times 11$ page of notes, a ruler, and a non-graphing calculator. Put everything else away. You may not share notes.
- Unless otherwise indicated, you must show your work and justify your answers. The correct answer with incomplete or missing supporting work may result in no credit.
- Place your final answer in the indicated spaces.
- Unless otherwise specified, you may round your final answer to two digits after the decimal.
- If you need more room, use the backs of the pages and indicate to the grader that you have done so. Raise your hand if you have a question. GOOD LUCK!

Problem	Total Points	Score
1	10	
2	14	
3	9	
4	9	
5	8	
Total	50	

- 1. (10 points)
 - (a) (6 points) Differentiate the following function. BOX your final answer. No need to simplify.
 - $y = \frac{\ln(x^2 3x)}{e^{5x} + e^2}$ $\frac{dy}{dx} =$

(b) (4 points) Based on the graph of f(x) shown below, identify which of the points A through G marked on the graph satisfy each of the following conditions.



(List all points that apply, no need to justify your answers)

- i. Critical point(s) for f(x):
- ii. Inflection point(s) for f(x):

iii. Point(s) where f'(x) = 0 and f''(x) = 0:

iv. Point(s) where f'(x) > 0 and f''(x) = 0:

2. (14 points) The total revenue, in thousands of dollars, for selling q thousand Items is given by:

$$TR(q) = \frac{1}{6}q^4 - \frac{16}{3}q^3 + 48q^2 + 100q.$$

(a) Compute the following derivatives:

TR'(q) =

TR''(q) =

 $TR^{\prime\prime\prime}(q) =$

(b) Find all the critical values of the **marginal revenue** function.

ANSWER: (list all) q =______thousand Items.

(c) At each of the quantities you found in part (b), use either the First or the Second Derivative Test to determine whether the **graph of marginal revenue** has a local maximum, a local minimum, or neither. Make sure to specify which test you use and show your work.

ANSWER: Local MAX at q =_____, Local min at q =_____

(d) Find the longest interval on which the **total revenue** function TR(q) is **concave down**. Justify.

ANSWER: From q =______to q =______thousand Items (e) Does the **total revenue** function have a local maximum at q = 10 thousand Items? Justify.

ANSWER: Yes/No, because: _

3. (9 points) Evaluate the following integrals. Simplify and BOX your final answer.

(a)
$$\int \left[\left(1 + x^2 \right) \left(\frac{1}{x} + 2x \right) + e^{0.5x} \right] dx =$$

(b)
$$\int_{1}^{4} \left(9x^2 - \frac{2}{\sqrt{x}}\right) dx =$$

4. (9 points) A company is selling Things. Suppose that the marginal revenue and marginal cost, in dollars per Thing, at q Things are:

MR(q) = 1200 $MC(q) = 60\sqrt{q+4}$



(a) What number of Things results in a maximal profit?

ANSWER: q =_____Things

(b) What is the maximum profit, assuming that the fixed costs are \$1000? Show all work.

ANSWER: ______dollars.

5. (8 points) The graph below respresents the RATE of ASCENT r(t) for a balloon. In this problem, you need not show work.



(a) List all times at which the **altitude graph** of this balloon has horizontal tangents:

- (b) At what time is the balloon at its lowest altitude? At t = _____
- (c) Give the longest time interval over which the balloon is rising and getting slower.

From $t = _____to t = _____$

t =

(d) Define a new function $A(m) = \int_0^m r(t) dt$, where r(t) is the function in the graph above.

- i. Estimate A(2) =_____
- ii. At what value(s) of m does A(m) have a local minimum? m =_____
- iii. Which of the following does the function A(m) represent? Circle all the correct answers. The altitude of the balloon at time t = m.

The change in altitude of the balloon from its initial position.

The velocity of the balloon at time t = m.

The change in the velocity of the balloon from its initial velocity

An antiderivative of r(t)

A derivative of r(t)