MATH 112
Exam II
Spring 2018

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	12	
4	14	
Total	50	

- Check that your exam contains 4 problems.

- You are allowed to use a TI-30XIIS 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)

   (a) Compute the derivative. You do not need to simplify.

   i. $y = \ln\left(3x^2 - 4 + \dfrac{1}{x}\right)$

   ii. $w = \dfrac{e^{20u}}{u + 7}$

   (b) Compute the integral. Place a box around your final answer.

   i. $\displaystyle\int \dfrac{5}{\sqrt{x^3}} + e^{x/4}\, dx$

   ii. $\displaystyle\int_1^{e^2} \dfrac{3}{2t}\, dt$

2. (12 points) Two hot air balloons are rising and falling.

   The **altitude** (in feet) of the Red Balloon after t minutes is given by

   $$R(t) = -20t^2 + 240t + 600.$$

   The **rate of ascent** (in feet per minute) of the Green Balloon after t minutes is given by

   $$g(t) = -6t^2 + 18t + 240.$$

   (a) During the time interval from $t = 5$ to $t = 10$, what is the lowest altitude the Red Balloon reaches?

   ANSWER: _____ feet

   (b) Find the instant (the positive value of t) at which the Green Balloon stops rising and begins to fall.

   ANSWER: $t =$_____ minutes

   (c) At $t = 0$, the Green Balloon is 126 feet higher than the Red Balloon. Find the formula for $G(t)$, the altitude (in feet) of the Green Balloon after t minutes.

   ANSWER: $G(t) =$_____

   (d) How high is the Red Balloon when the Green Balloon is rising most rapidly?

   ANSWER: _____ feet

3. (12 points) Let $f(x) = 4x^3 - 42x^2 - 360x + 25$.

   (a) Find all critical values of $f(x)$. (Your answers may be *positive* or *negative*.)

   ANSWER: (list all) $x =$ _____

   (b) Use the Second Derivative Test to determine whether each of the critical values you found in part (a) gives a local maximum or a local minimum of f.

   ANSWER: $x =$ _____ gives a local (circle one)   max   min

   $x =$ _____ gives a local (circle one)   max   min

   (c) Give the longest interval on which f is **decreasing** and **concave up**. If no such interval exists, circle NONE.

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

4. (14 points) You sell Things. Your **profit** (in dollars) for selling q Things is given by a function $P(q)$. The graph below shows the **marginal profit** $MP(q)$ in dollars per Thing. Recall that marginal profit is the **derivative** of profit. That is, the graph below is the graph of $P'(q)$.
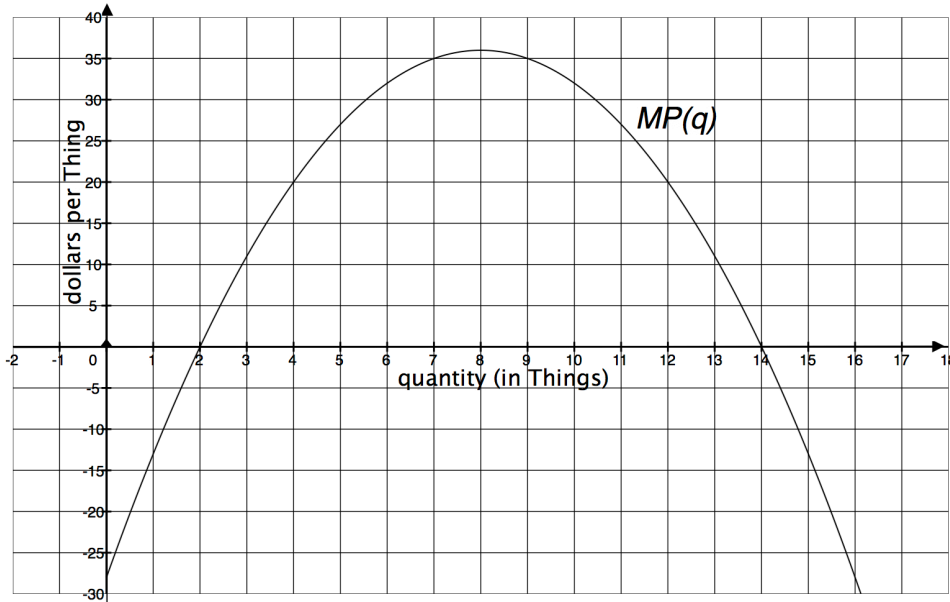
YOU DO NOT NEED TO SHOW ANY WORK FOR THIS QUESTION.

For questions (a)-(e), if there is no such quantity or interval, circle the word NONE.

(a) Name the longest interval on which the graph of **marginal profit** is increasing.

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

(b) Name the longest interval on which the graph of **profit** is increasing.

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

(c) Name the longest interval on which the graph of $P''(q)$ is increasing.

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

(d) Name all quantities at which **profit** has a local maximum.

ANSWER: (list all) $q=$_____   or   NONE

(e) Name all quantities at which **marginal revenue** is equal to **marginal cost**.

ANSWER: (list all) $q=$_____   or   NONE

(f) If quantity changes from $q = 0$ to $q = 4$, does profit increase or decrease? By how much?

ANSWER: profit will (circle one) increase   decrease   by \$_____

(g) Your fixed costs are \$45. What is $P(2)$?

ANSWER: $P(2) =$_____