

MATH 112
Exam II
Winter 2017

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	8	
2	10	
3	19	
4	13	
Total	50	

- Check that your exam contains 4 problems on 5 pages.
- 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. (8 points)

(a) Compute the derivative of $y = (3 + x \ln(x))^{16}$. DO NOT SIMPLIFY.

Put a box around your answer.

(b) Let $A(m) = \int_0^m \frac{x^2}{4+x} dx$. Compute the value of $A'(2)$.

Put a box around your answer.

(c) Which of the following is an **anti-derivative** of the function

$$g(x) = (e^{5x} + x^3)^9(5e^{5x} + 3x^2)?$$

i. $G(x) = (e^{5x} + x^3)^{10}$

ii. $G(x) = \frac{1}{10} (e^{5x} + x^3)^{10}$

iii. $G(x) = \left(\frac{1}{5}e^{5x} + \frac{1}{4}x^4\right)^9 (e^{5x} + x^3)$

iv. none of the above

ANSWER: _____

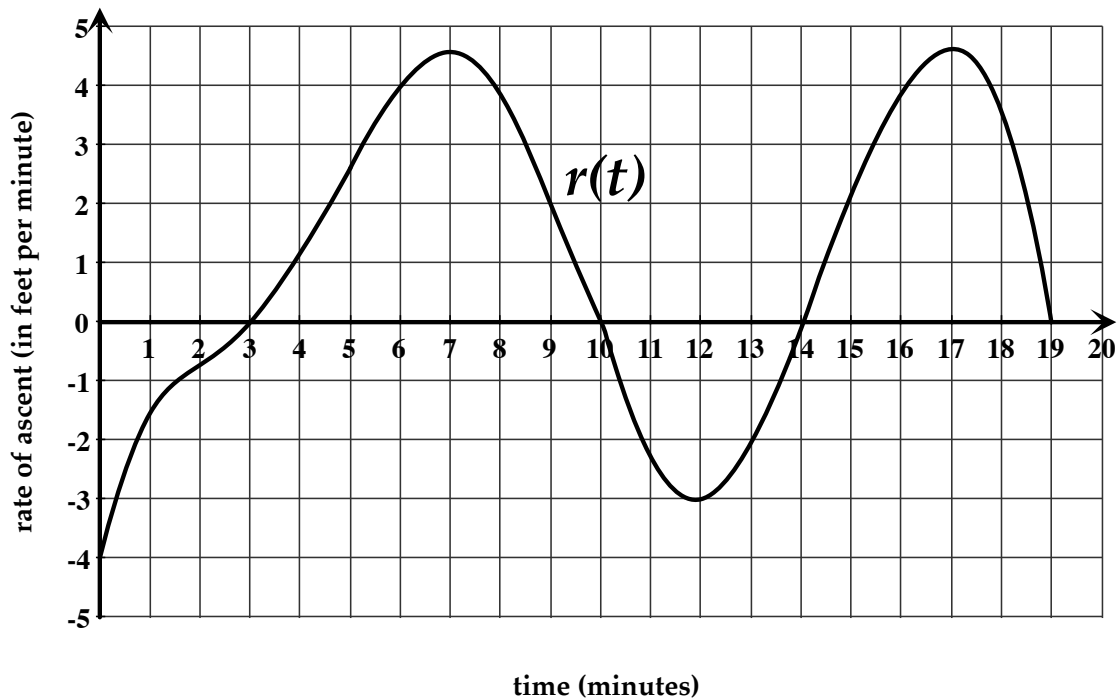
2. (12 points) Compute the integral. Put a box around your answer.

(a) $\int \left(\frac{4}{7x} + 1000e^{0.01x} \right) dx$

(b) $\int (2x - 5)^2 dx$

(c) $\int_1^{25} 6\sqrt{x} - \frac{3}{2\sqrt{x}} dx$

3. (19 points) The altitude of a balloon is given by the function $A(t)$. The graph below shows $r(t) = A'(t)$, the instantaneous rate of ascent of the balloon as it rises and falls for 19 minutes.



- (a) Name all times at which the graph of $r(t)$ has horizontal tangents.

ANSWER: (list all) $t =$ _____

- (b) Name all times at which the graph of $A(t)$ has horizontal tangents.

ANSWER: (list all) $t =$ _____ minutes

- (c) Name the time in the first 10 minutes when the balloon is at its lowest altitude.

ANSWER: $t =$ _____ minutes

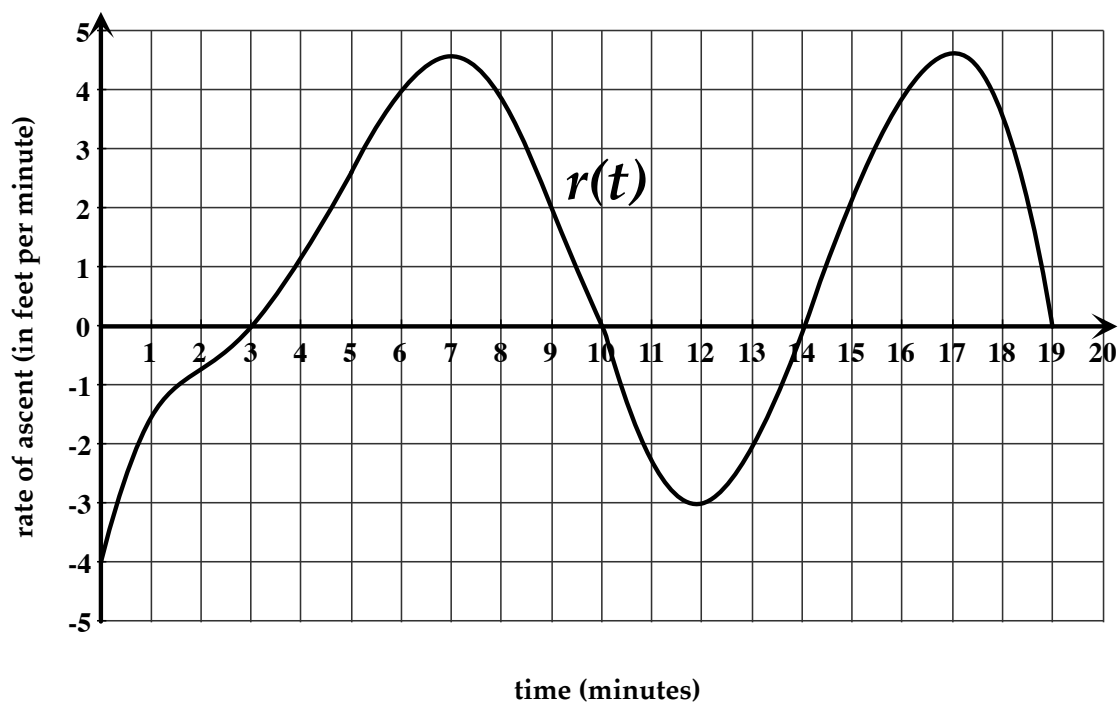
- (d) Name the time in the first 10 minutes when the balloon is at its highest altitude.

ANSWER: $t =$ _____ minutes

- (e) Compute the balloon's **average rate of ascent** from $t = 3$ to $t = 5$.

ANSWER: _____ feet per minute

Here is the graph of the balloon's rate of ascent again.



- (f) Find the four-minute interval during which the balloon gains the most altitude.

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

How much altitude does the balloon gain during this four-minute interval?

ANSWER: _____ feet

- (g) For each of the following intervals, determine whether the graph of **altitude** is increasing or decreasing and concave up or concave down. If it is impossible to determine from the information give, circle CAN'T TELL.

from $t = 0$ to $t = 3$	increasing	decreasing	CAN'T TELL
	concave up	concave down	CAN'T TELL
from $t = 7$ to $t = 10$	increasing	decreasing	CAN'T TELL
	concave up	concave down	CAN'T TELL

4. (13 points) You sell Objects. Your **marginal revenue** and **marginal cost** are given by

$$MR(q) = 1324 - 4q \quad MC(q) = 3q^2 - 60q + 304.$$

(q is measured in Objects and MR and MC in dollars per Object.)

- (a) Find all critical values of **total revenue** and determine whether each gives a local maximum or a local minimum of total revenue. Put a box around your answer(s).

- (b) Find all quantities at which the graph of **total cost** has a point of inflection. If it has no points of inflection, write NONE.

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

- (c) Find the quantity that maximizes **profit**.

ANSWER: $q =$ _____ Objects

- (d) The maximum possible **profit** for selling Objects is \$23,065. Find **Fixed Cost**.

ANSWER: $FC =$ \$ _____