

MATH 112
Exam I - Version 1
April 22, 2004

Name _____

Student ID # _____

Section _____

1	16	
2	16	
3	18	
Total	50	

- You are allowed to use a calculator, a ruler, and one sheet of handwritten notes.
- Please check that your exam contains three problems on three pages.
- Please turn your cell phone OFF and put it away for the duration of the exam.
- Unless otherwise indicated, you must show your work. The correct answer with no supporting work may result in no credit.
- Write your answers in the specified locations.
- If you need more room, use the backs of the pages and indicate to the reader that you have done so. If you still need more paper, please ask for some.
- When rounding is necessary, round your **final answer** to two digits after the decimal.
- Raise your hand if you have a question.
- Put your name on your sheet of notes and turn it in with the exam.
- You have 50 minutes to complete the exam.

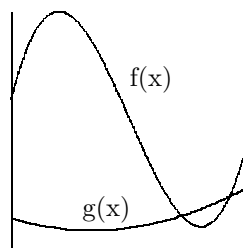
GOOD LUCK!

1. (16 points)

The graphs of $f(x)$ and $g(x)$ are given at right.
Their formulas are

$$f(x) = 2x^3 - 30x^2 + 96x + 150 \text{ and}$$

$$g(x) = x^2 - 6.8x + 30.$$



(a) Use the derivative rules to compute $f'(x)$ and $g'(x)$.

$$\text{ANSWER: } f'(x) = \underline{\hspace{10cm}}$$

$$g'(x) = \underline{\hspace{10cm}}$$

(b) Compute and simplify $\frac{g(a+h) - g(a)}{h}$.

$$\text{ANSWER: } \frac{g(a+h) - g(a)}{h} = \underline{\hspace{10cm}}$$

(c) Give the longest interval of values of x over which $g(x)$ is increasing and $f(x)$ is decreasing. (As always, show all work.)

$$\text{ANSWER: from } x = \underline{\hspace{5cm}} \text{ to } x = \underline{\hspace{5cm}}$$

(d) For what value of x is $f'(x)$ smallest?

$$\text{ANSWER: } x = \underline{\hspace{10cm}}$$

2. (16 points) You sell *Items*. Your profit for selling q thousand Items is given by a function $P(q)$, measured in thousands of dollars. We do not have the formula for profit, but we do know a formula for the *change in profit* that comes from increasing quantity from q_1 to q_2 thousand Items:

$$P(q_2) - P(q_1) = \frac{3}{32}(q_2 - q_1)(16 - q_2 - q_1).$$

- (a) Find the increase in profit that comes from changing quantity from 2 thousand Items to 4 thousand Items.

ANSWER: _____ thousand dollars

- (b) Compute the value of $\frac{P(8) - P(3)}{5}$.

ANSWER: $\frac{P(8) - P(3)}{5} =$ _____

- (c) Write out a formula for $\frac{P(q+h) - P(q)}{h}$.

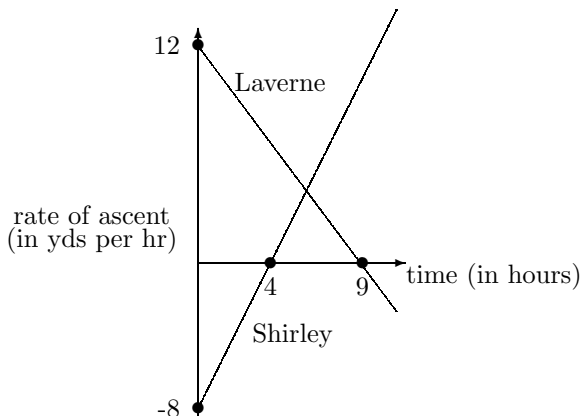
ANSWER: $\frac{P(q+h) - P(q)}{h} =$ _____

- (d) For what quantity is $P'(q) = 1.2$?

ANSWER: $q =$ _____

3. (18 points)

Laverne and Shirley are each in a hot-air balloon. At $t = 0$, the balloons are both 125 yards above the ground. The graphs at right give the balloons' *rate of ascent* at time t .



(a) Use the graphs to answer the following questions.

i. Is the distance between the balloons greater at $t = 3$ or at $t = 4$?

ANSWER: (circle one) $t = 3$ $t = 4$

ii. Give a four-hour interval during which both balloons are rising.

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

iii. At what time is Laverne's balloon at its maximum height?

ANSWER: $t =$ _____

(b) Use the points labeled on the graph to find linear formulas for each balloon's rate of ascent.

ANSWER: Laverne: _____

Shirley: _____

(c) At what time in the first seven hours is the distance between the balloons the greatest?

ANSWER: $t =$ _____ hours

(d) Suppose Shirley's altitude at time t is given by the function $S(t)$. What is the value of $S'(10)$?

ANSWER: $S'(10) =$ _____