

NAME: _____

Student ID #: _____

QUIZ SECTION: _____

Math 112
Midterm I
February 4, 2010

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Total:	50	

- You are allowed to use a calculator, a ruler, and one sheet of notes.
- Besides this cover page, your exam should contain 5 problems on 4 pages. Make sure you have a complete test.
- Unless otherwise instructed, you **must show how you get your answers**.
Answers missing supporting work may result in little or no credit, even if they are correct.
- If an algebraic method is available, answers obtained by guessing, reading values off a graphing calculator, or plug-and-check will get little or no credit.
- If you need more room, use the backs of pages and indicate to the reader that you have done so.
- Raise your hand if you have a question.

GOOD LUCK!

1 (7 points) The function $g(x)$ is given by: $g(x) = 2x^2 - x$.

- a) (5 pts) Write a formula in terms of m and h for the **slope of the secant line** through the graph of $g(x)$ at the points $x = m$ and $x = m + h$. Show work and simplify your answer as far as possible.

Answer: _____

- b) (2 pts) Use the answer you obtained in part (a) to compute $g'(m)$. Clearly indicate your steps.

Answer: $g'(m) =$ _____

2 (8 points) Show work and simplify your answers.

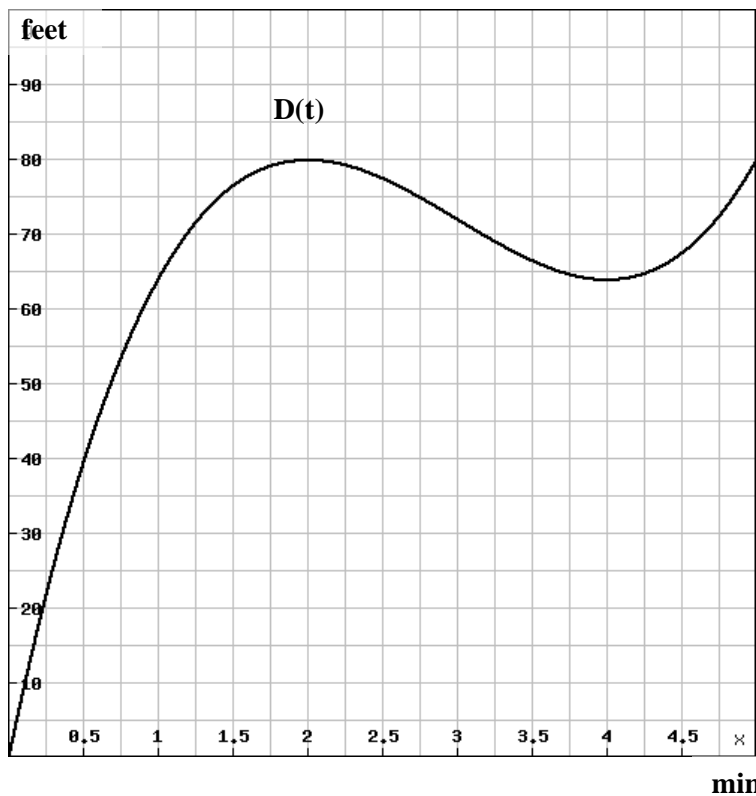
- a) Find the derivative $f'(x)$ of the function $f(x) = (1 - x^2)(3 + 5x)$.

Answer: $f'(x) =$ _____

- b) Find $\frac{ds}{dt}$, if $s = 2\sqrt[3]{t^2} - \frac{5}{\sqrt{t}} + 3$.

Answer: $\frac{ds}{dt} =$ _____

3 (10 points) The following is the graph of a function $D(t)$, representing the distance along a straight road between a remote-controlled car and its owner.



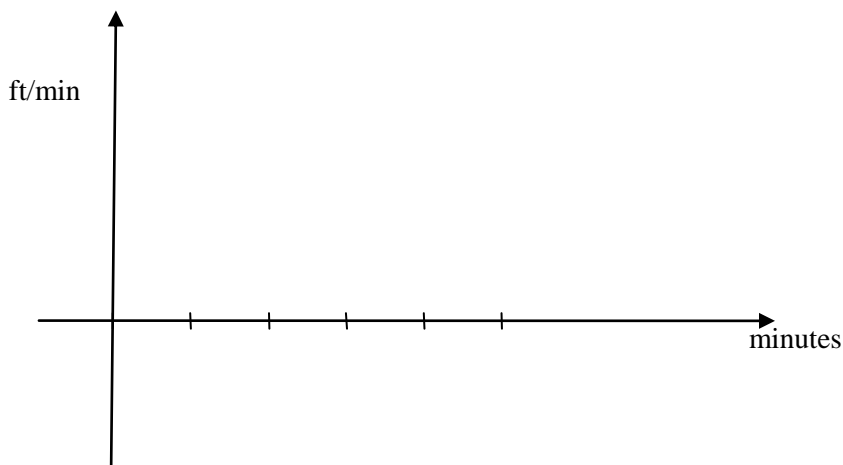
a) (3 pts) Estimate carefully the instantaneous speed of the car at 1 minute. Show your work.

Answer: _____ ft/min

b) (3 pts) Estimate the value of $\frac{D(2.6) - D(2.5)}{0.1}$. Show your work.

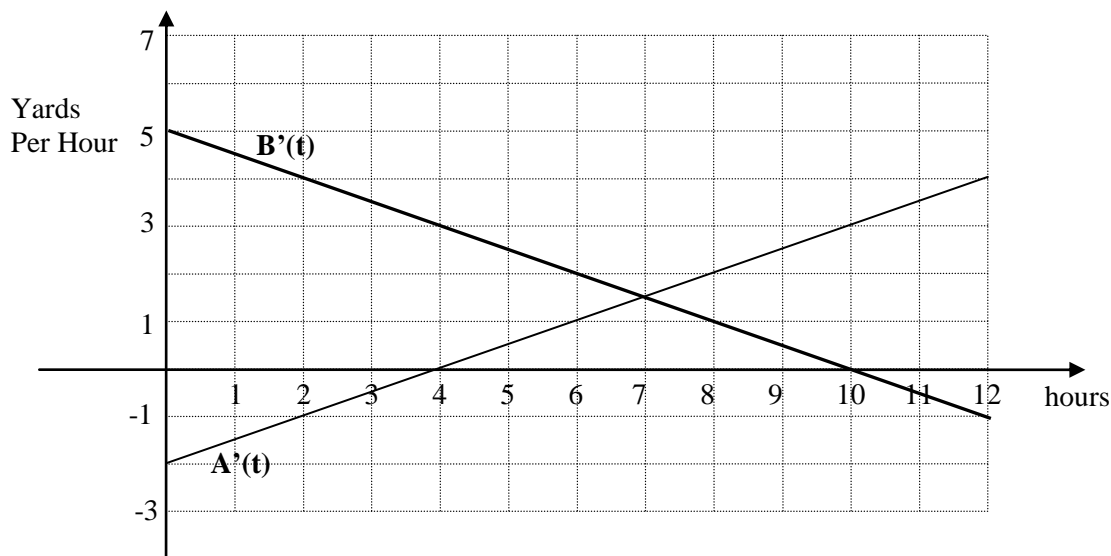
Answer: _____

c) (4 pts) Sketch a rough graph of the **speed** of this car. Label the x-intercepts. No need to label any y-coordinates.



4 (12 Points) In this problem you don't need to justify any of your answers.

Two balloons, A & B, start off at the same altitude of 40 yards above ground at time $t = 0$, then they move up and down. The graphs below are the corresponding **rate-of-ascent graphs** for the two balloons.



a) For each of the following statements **circle the correct answer**: True (T), False (F), or cannot tell based on the given information (CT).

- i) At $t = 2$ hours, balloon A's altitude is higher than 40 yards. T F CT
- ii) At time $t = 7$ hrs, balloon B is higher than balloon A. T F CT
- iii) The distance between the two balloons is greater at $t = 2$ than at $t = 4$ T F CT

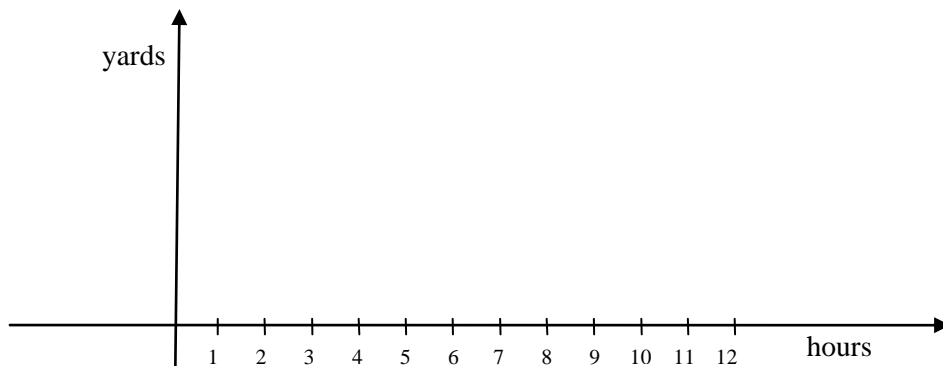
b) Find a 2 hour time interval, if any exists, during which balloon A is ascending but balloon B is descending.

Answer: From $t =$ _____ to $t =$ _____ hours, --OR-- circle "none exists".

c) When is the distance between the two balloons the greatest?

Answer: At $t =$ _____ hours.

d) Sketch $A(t)$, the **altitude graph** for **balloon A**. Label the y-intercept (no other y-coordinates are required)

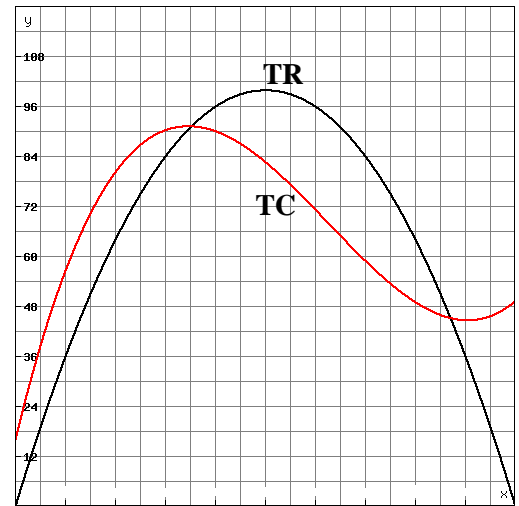


5 (13 Points) The Total Revenue and Total Cost, in **hundreds of dollars**, for producing q **hundred Items** are given by the following formulas:

$$TR(q) = -q^2 + 20q$$

$$TC(q) = \frac{1}{15}q^3 - \frac{25}{10}q^2 + 25q + 16$$

a) (5 pts) Use the derivative rules to write formulas in terms of q for the Marginal Revenue and the Marginal Cost at q hundred Items.



$MR(q) =$ _____

$MC(q) =$ _____ Units for both MR and MC: _____

b) (5 pts) Compute the quantity that maximizes the profit. Show work and round your answer to the nearest two decimal digits.

Answer: Profit is maximal at _____ hundred Items

c) (3pts) Compute the maximum possible profit. Round your answer to the nearest two decimal digits.

Answer: The maximum profit is _____ hundred dollars