

NAME: _____

Student ID #: _____

QUIZ SECTION: _____

Math 112 A
Midterm I
April 26, 2011

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|---------------|-----------|--|
| Problem 1 | 12 | |
| Problem 2 | 12 | |
| Problem 3 | 12 | |
| Problem 4 | 14 | |
| Total: | 50 | |

- You are allowed to use a calculator, a ruler, and one sheet of notes.
- Your exam should contain 5 pages (including this one) and 4 problems. Make sure you have a complete test.
- Unless otherwise instructed, you **must show how you get your answers**. Correct (or incorrect) answers with no supporting work may result in little or no credit.
- Unless otherwise specified, you may round your answers to two decimal digits.
- If an algebraic method is available, answers obtained by guessing, approximating, 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) (12 points) Use the derivative rules to compute the derivatives of the following functions. Show your work. Simplify your answers (but you may leave negative or fractional powers as they are).

a) $f(x) = (2x + 1)(7 - x^2)$

Answer: $f'(x) =$ _____

b) $y = 5\sqrt[3]{x} + x\sqrt{x}$

Answer: $\frac{dy}{dx} =$ _____

c) $g(x) = \frac{x^5 + 7}{x^2} - 0.77$

Answer: $g'(x) =$ _____

2. (12 points) In the picture below, there is a rough partial drawing of the graph of a function $f(x)$, together with the secant line from $x = s$ to $x = s + r$, and the tangent line at $x = s$.

- a) Certain distances and slopes of lines are labeled (A) – (D) in the picture below. For each quantity listed below, place the label that corresponds to that quantity in the adjacent blank. If none of the labels correspond, write “none”. No need to explain or show work.

$$f(s) = \underline{\hspace{2cm}}$$

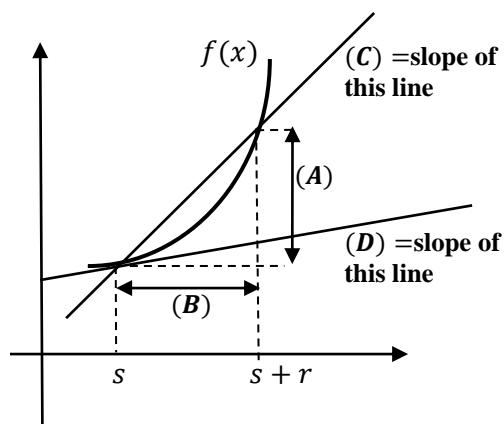
$$r = \underline{\hspace{2cm}}$$

$$f'(s) = \underline{\hspace{2cm}}$$

$$\frac{f(s+r) - f(s)}{r} = \underline{\hspace{2cm}}$$

$$\frac{f(s) - f(r)}{s - r} = \underline{\hspace{2cm}}$$

$$f(s+r) - f(s) = \underline{\hspace{2cm}}$$



- b) We are not given a formula for $f(x)$, but we are told instead that:

$$f(s+r) - f(s) = \frac{2sr + r}{(s+3)(s+r)}$$

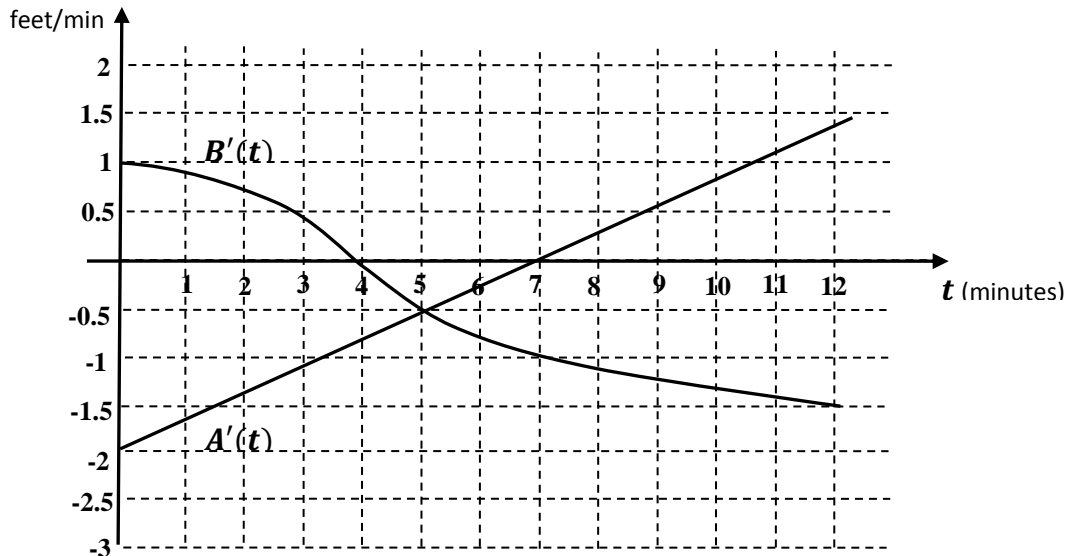
Compute $f'(7)$. Show all steps.

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Answer: $f'(7) = \underline{\hspace{2cm}}$

3. (12 Points) The altitude vs. time functions for two balloons are denoted by $A(t)$ and $B(t)$. Initially, $A(0) = B(0) = 40$ feet.

The following are the graphs for **the rates-of-ascent** $A'(t)$ and $B'(t)$ of the two balloons.



Answer the following questions. **No need to justify your answers.**

a) Estimate the value of: $\frac{B(3.1)-B(3)}{0.1}$

Answer: $\frac{B(3.1)-B(3)}{0.1} \cong$ _____

b) Give the **longest** time interval during which the distance between the two balloons is increasing.

Answer: from $t =$ ____ to $t =$ ____ minutes

c) When will balloon A reach its lowest altitude?

Answer: at $t =$ ____ minutes

d) Describe the motion of the balloons **during the first 5 minutes** ($t = 0$ to $t = 5$ minutes.)

Circle one correct answer for each balloon.

Balloon A is:

ascending OR descending OR first ascending then descending OR first descending then ascending

Balloon B is:

ascending OR descending OR first ascending then descending OR first descending then ascending

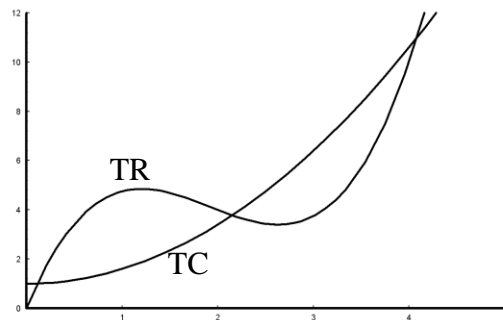
4. (14 Points)

To the right are the Total Revenue (TR) and Total Cost (TC) graphs for manufacturing and selling trinkets.

The corresponding formulas are:

$$TR(q) = q^3 - 5.75q^2 + 9.5q$$

$$TC(q) = 0.6q^2 + 1$$



where the quantity q is in hundreds of trinkets, and both TR and TC are measured in hundreds of dollars.

a) Find formulas in terms of q for the Marginal Revenue and the Marginal Cost. Include correct units.

Answer: $MR(q) =$ _____

$MC(q) =$ _____

MR and MC are measured in (circle one): *dollars* OR *hundreds of dollars*

b) What quantity q will result in the largest profit? Round your answer to 2 decimal digits.

Answer: Profit is maximal for $q =$ _____ hundred trinkets.

c) Find all quantities q where the Total Revenue graph has a horizontal tangent line.

Answer: $q =$ _____ hundred trinkets.