Closing Tues: HW 9.7(2), 9.8, 9.9

Exam 1 is Thur, Jan. 25th covers 9.3 - 9.9.

9.9 Applications *(continued)*

Recall from last class (and Math 111):

If $p(x) =$ selling price per item (demand)

$AC(x) =$ average cost per item

then $TR(x) = p(x) \cdot x$

$TC(x) = AC(x) \cdot x.$

Entry Task (*directly* from HW 9.9/5)

The price of a certain product is $400.

The cost per unit of producing the product is 130 + 0.5x dollars/item.

Give the functions *TR(x), TC(x), MR(x)* and *MC(x)*.

Recall from Math 111:

Profit and marginal profit are given by

$$P(x) = TR(x) - TC(x)$$

$$MP(x) = MR(x) - MC(x)$$

When profit is maximized

$$MR(x) = MC(x)$$

Specifically, where it switches from MR > MC to MR < MC.

Continuing example from the entry task:

How many units should the firm produce and sell to maximize its profits?

Another example
(*directly* from an old midterm):

You sell items.
If q is in **<u>hundred</u> items**, then TR(q) and TC(q) in **<u>hundred</u> dollars** are given by

$$TR(q) = 30q$$
$$TC(q) = q^3 - 15q^2 + 78q + 10$$

a. Find marginal cost at 2 hundred items

b. Find the longest interval over which marginal revenue exceeds marginal cost.

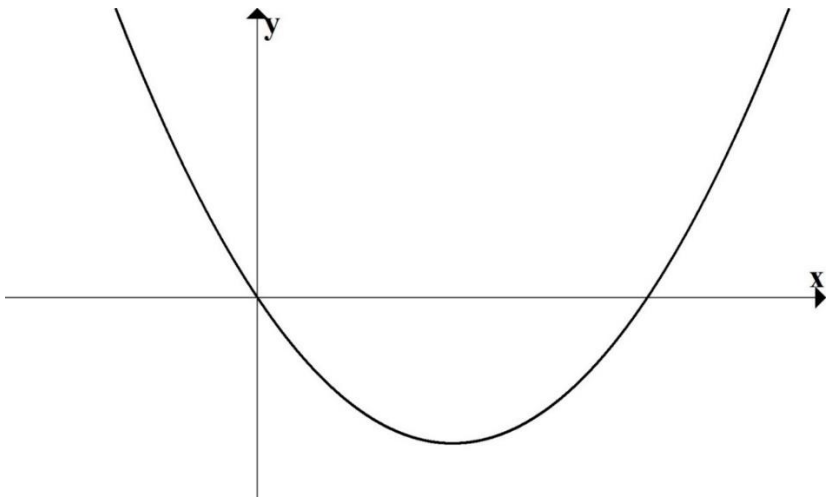
c. What is the maximum value of profit?

Graphs and Derivatives

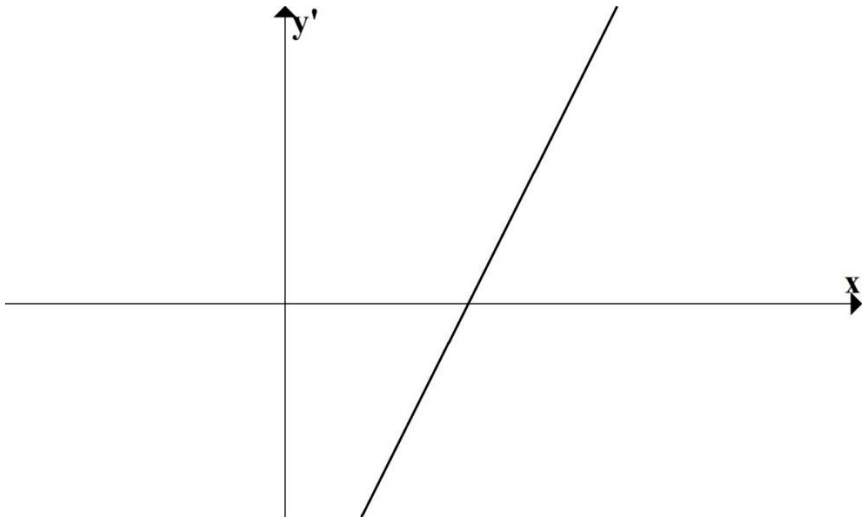
Example: Let $f(x) = 2x^2 - 3x$

Find $f'(x)$.

$f(x) = 2x^2 - 3x$



$f'(x) = 4x - 3$



Notes/Observations: Given $y = f(x)$.

- $y = f'(x)$ is a new function.
- $f(x) =$ "height of the graph at *x*"
- $f'(x) =$ "slope of $f(x)$ at x"
- $f'(x)$ is "instantaneous rate of change" (speedometer speed)
- The units of $f'(x)$ are $\frac{\text{y}-\text{units}}{\text{x}-\text{units}}$.

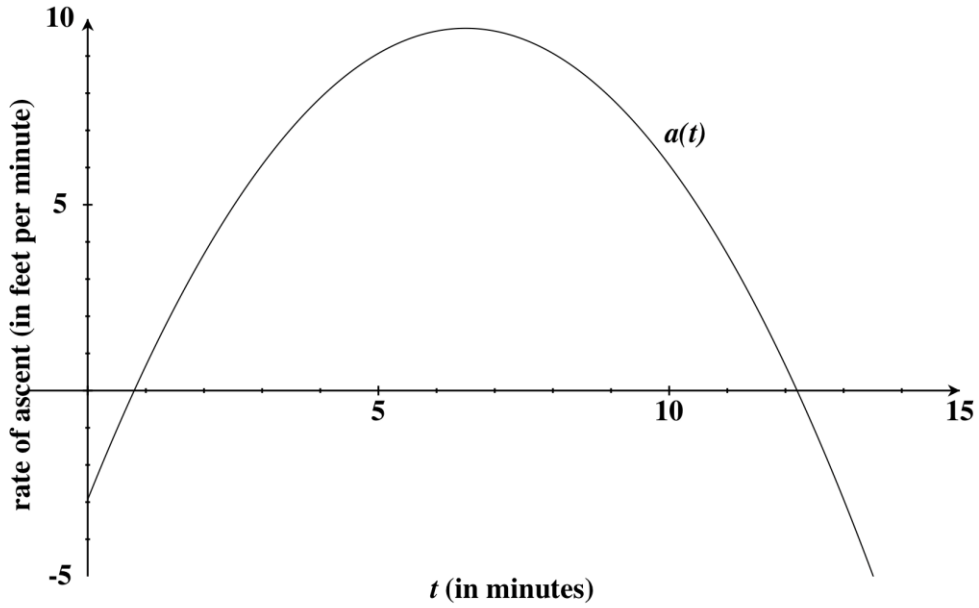
Fundamental to all applications:

$f(x)$	$f'(x)$
horiz. tangent	zero
increasing	positive
decreasing	negative

9.9 HW Problem 8:

Rate of ascent for a balloon (in feet per minute) is given by

$$a(t) = -0.3t^2 + 3.9t - 2.928$$



How will you answer these:

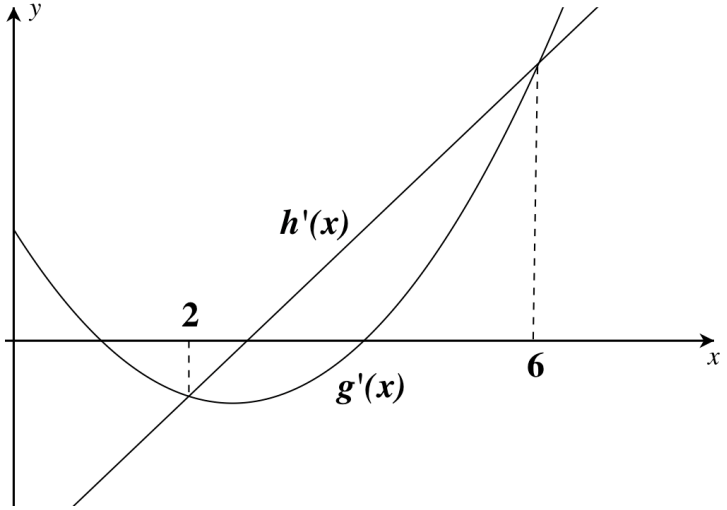
(a) Find the longest integral over which Balloon A is rising.

(d) Find the time at which the balloon is rising the fastest?

HW 9.9/1:

Given $g'(x) = 2x^2 - 10x + 8$

$h'(x) = 6x - 16$



What does it mean when…

(a) … g’(x) crosses the x-axis?

… h’(x) crosses the x-axis?

(b) … g’(x) has a horizontal tangent

(and how do you find it)?

(c) … h’(x) intersects g’(x)?