Math 112 Exam 1 Review

The exam will cover material from WS 1-11.

Worksheet 1 and 2: Speed/MR/MC and Tangent Lines

1. $\dfrac{f(b)-f(a)}{b-a}$ = 'Slope of the Secant line from a to b'.

2. $\dfrac{f(t)}{t}$ = 'The Slope of the Diagonal Line'.

3. 'Instantaneous Speed' = 'The Slope of a Tangent Line'.

4. MR = Marginal Revenue $\approx$ 'Slope of the tangent line to the TR graph."

5. MC = Marginal Cost $\approx$ 'Slope of the tangent line to the TC graph."

WS 3, 7, and 8: Tangents & Secants

1. If h is small, then

$$\text{`Slope of the Tangent Line at } x\text{'}$$
$$\approx \text{`Slope of the Secan Line from } x \text{ to } x+h\text{'}$$
$$= \frac{f(x+h)-f(x)}{h}$$

2. *Be able to find derivatives without shortcuts*
   (a) First, simplify $\frac{f(x+h)-f(x)}{h}$.
   (b) Let h go to zero to get $f'(x)$.

3. Understand how to get information from equations such as: $\frac{H(m+r)-H(m)}{r} = 4m + 2r - 3$

   $\frac{g(2+h)-g(2)}{h} = \frac{1}{(2+1)(2+h+1)}$

   $\frac{R(q_2)-R(q_1)}{q_2-q_1} = 2q_2 + q_1 + 5.$

4. You should be able to find $H'(m)$, $g'(2)$, and $R'(q)$ from the information above.

WS 9: Derivative Shortcuts

Become a derivative machine:

1. *Expand the expression.*
2. *Rewrite the powers.*
3. *Take the Derivative.* Now apply the power rule.
   (a) Bring down the power.
   (b) Subtract one from the exponent.
4. *Simplify/Done.*

PRACTICE, PRACTICE, PRACTICE!!!

WS 4, 5, 6, 10 and 11: Derived Graphs

1. *Connections between Derived and Original Graphs*

ORIGINAL GRAPH		**DERIVED GRAPH**
FLAT (horizontal tangent)	$\Longleftrightarrow$	ZERO (crosses x-axis)
INCREASING (uphill)	$\Longleftrightarrow$	POSITIVE (above x-axis)
DECREASING (downhill)	$\Longleftrightarrow$	NEGATIVE (below x-axis)
SLOPE OF TANGENT	$\Longleftrightarrow$	HEIGHT (or y-value)
DISTANCE	$\Longleftrightarrow$	SPEED
TR	$\Longleftrightarrow$	MR
TC	$\Longleftrightarrow$	MC
HEIGHT OF A BALLOON	$\Longleftrightarrow$	RATE OF ASCENT

2. *Major Applications of these Connections*

(a) *To find the Quantity that gives Max Profit*

i. Compute $MR = R'(q)$.

ii. Compute $MC = C'(q)$.

iii. Solve $MR = MC$.

(b) *To find the Locations of Horizontal Tangents for some function, $f(x)$*

i. Find $f'(x)$ (the derivative).

ii. Solve $f'(x) = 0$.