Math 111 Exam 1 is in lecture. Your assigned seat will be posted on Canvas.

Exam Rules and Details:
1. Covers Supplement 1-9. There will be three pages of questions and you will write your answers in the spaces provided on the exam. You have 50 minutes, so time is a factor. Plan appropriately. Never spend more than 15 minutes on a page!
2. You are allowed:
    a. A scientific calculator (no graphing)
    b. A ruler
    c. One 8.5 by 11 inch sheet of **handwritten notes** (you can write on the front and back)
    d. A pencil or pen (no colored pens)
3. **There are multiple versions of the test**, if you give any answer (even just one) that is only appropriate for the other versions, then we will submit the exam to the academic misconduct board and you will get a zero on the entire exam. You can help yourself avoid suspicion of cheating by **showing your work**.
4. **Also, it is in your best interest to show work because you can get partial credit!** *Here are different ways to show work*:
    a. Draw lines and label them on the graph.
    b. Write down any points you use to find a slope.
    c. Perhaps write a few words "diagonal line slope" or "slope of a tangent" or "largest vertical gap" etc.
    d. You don't need to write a full explanation, just show *something*; some small amount of work on the problem that actually shows you did something and didn't just guess or cheat.
5. **There are NO make-up exams for any reason!**
    You should plan on taking the exam, take it seriously.
    If you do have to miss for unavoidable and well-documented reasons here is the policy:
    *   If you are <u>sick</u> the day of the exam, then you must contact me before your exam time to let me know.
    *   If you have an <u>unavoidable, extreme emergency</u> come up, then you need to let me know as soon as possible after the emergency is over.
    In either case, as long as you have contacted me promptly, then your grade will be prorated (meaning the exam will be thrown out and your other exams will be weighted significantly more heavily).

Exam Notes:
I have been giving advice on studying each week in. So you shouldn't have to ask me how to study, you can look at old newsletters and notes. But let me re-iterate a few things…
How do I study?
1. **Step 1: Homework!** You should know all the homework well. The majority of the exam will be almost word-for-word the same as problems you saw in homework. ALL homework is fair game. If I give a problem that is identical to homework, even a "challenging homework problem", then you should be able to comfortably do it. I will have several problems directly from homework. So study and review homework!

2. **Step 2: Old Exams**: If you are desperately worried about your grade in this class and your performance on this exam, then you should work through <u>ALL</u> the old exams from the Midterm 1 section of my exam archive.
    You should study the exams in the exam archive in two different ways:
    a. **Detail Studying**: Work through several old midterms in detail (put yourself in an exam like situation including timing yourself). This will get you ready for what it will feel like when you take the test.
    b. **Quick Recognition**: A different (and very useful) other type of studying is problem recognition.
        Here is how you do it:
        i.   Get out some notebook paper, then open up the exam archive and click on an exam.
        ii.   Read 1(a) and on your paper write in words what you would do. Spend no more than 10-15 seconds doing this. If you don't know how to do it, make a star and come back to it later.
        iii.   Then do the same thing for 1(b) (again spend no more than 10-15 seconds). Write down how you would start the problem.
        iv.   Keep doing this through the entire exam (it should take you less than 5 minutes).
        v.   Then do it again for another exam. In this way, you can look through 4 or 5 exams in 20 minutes. You also gain confidence and you quickly learn which recurring topics you are struggling with.

See the next pages for a quick review…

A **secant** line goes through a graph of a curve at two points.

A **diagonal** line goes through the origin.

A **tangent** line "just touches" the graph at a point with the same slope as the graph at that point.

$f(b) - f(a)$ = "change in height on f(x) from x = a to x = b"

$\dfrac{f(b)-f(a)}{b-a}$ = "slope of the secant line to f(x) from x = a to x = b" = "average rate of change of f(x) from x=a to x=b"

$\dfrac{f(b)-f(0)}{b-0}$ = "slope of the secant line to f(x) from x = 0 to x = b" = "**overall** average rate of change of f(x) at x = b"

$\dfrac{f(b)}{b}$ = "slope of the diagonal line to f(x) at x = b"

TR(q) = price · quantity	TC(q) = FC + VC(q)	P(q) = TR(q) − TC(q)
$MR(q) = \dfrac{TR(q+1)-TR(q)}{q+1-q}$	$MC(q) = \dfrac{TC(q+1)-TC(q)}{q+1-q}$	MP(q) = MR(q) − MC(q)
$AR(q) = \dfrac{TR(q)}{q}$	$AC(q) = \dfrac{TC(q)}{q}$	$AVC(q) = \dfrac{VC(q)}{q}$
D(t) = distance traveled	$ATS(t) = \dfrac{D(t)}{t}$ (ave. trip speed)	$AS(t) = \dfrac{D(b)-D(a)}{b-a}$ (ave. speed)
A(t) = total amount (stock, water, *etc*)	Overall ave. rate = $\dfrac{A(b)-A(0)}{b-0}$	Average rate = $\dfrac{A(b)-A(a)}{b-a}$

Be able to translate between functional notation and graphs. And be able to interpret your answers.

For total amount graphs (TR, TC, VC, Dist, Stock value, Water in a reservoir, etc..): **Get your ruler out.**
When asked for a rate: Draw the appropriate line, get two points that are easy to read and far apart, compute slope.
When given a rate: Draw a reference line, and slide your ruler parallel to the desired interval, read off the intersections.

For graphs that give rates or increments (MR, MC, AC, AVC, change in temp, rates of growth, …): **Put ruler away!**
Carefully read! Make a table of what the first several dots represent. Write down the relevant definitions.
Then for each question, you will read <u>an individual dot</u> and answer the question. You will not be comparing dots; that doesn't make sense.

Business Facts:
1. Given a selling price, *p*: TR(q) = pq is a diagonal line with slope *p*. And *MR(q) = p* is a horizontal line at *p*.

2. The graphs of TC(q) and VC(q) are the same just shifted by FC.

3. Profit, P(q), is the vertical gap between TR(q) and TC(q) (positive for TR above TC, negative for TR below TC).

4. **Profit is maximized at the quantity** when
   (a) There is the largest vertical gap when TR is above TC.
   (b) The slope of the tangent to TR matches the slope of the tangent to TC, and
   (c) When MR(q) intersects MC(q).

5. **BEP = Break Even Price** is the price at which it no longer becomes possible to have a positive profit.
   It can be found by:
   (a) Drawing the lowest diagonal (TR) line that just touches TC and finding the slope.
   (b) Finding the lowest value of AC.
   (c) Finding the value at which AC equals MC.

6. **SDP = Shutdown Price** is the price at which it no longer becomes possible to recover any fixed costs.
   It can be found by:
   (d) Drawing the lowest diagonal (TR) line that just touches VC and finding the slope.
   (e) Finding the lowest value of AVC.
   (f) Finding the value at which AVC equals MC.