Closing Thurs: 2.2, 2.3(part 1)
Closing Tues: 2.3(part 2)
Closing Next Thurs: 1.5, 4.1

Example continued from last time…
We found:

$\qquad q = $ quantity in Things
$\qquad p = -2q + 22 = $ price per Thing
$TR(q) = pq = -2q^2 + 22q \quad$ dollars
$TC(q) = 20 + 6q \qquad\qquad$ dollars
$P(q) = -2q^2 + 16q - 20 \qquad$ dollars

Using $\quad MC(q) = \dfrac{TC(q+1) - TC(q)}{q+1-1} \quad$ and

$\qquad\qquad MR(q) = \dfrac{TR(q+1) - TR(q)}{q+1-1}$

we also found
$MC(q) = 6 \qquad\qquad$ dollars per Thing
$MR(q) = -4q + 20$ dollars per Thing

Entry Task:
How would you start these question?
  1. At what quantities is profit zero?
     (*i.e.* the break even points)
  2. At what quantity is profit
     maximized? And what is maximum
     profit?

How to approach all the problems:

STEP 0: Read the question. Identify the function(s) in the question.

STEP 1: Find all related functions. (Using 2.2 skills)

STEP 2: Roughly sketch the function. (Is it a parabola that opens upward or downward? Is it a line with a positive slope or a negative slope?)

STEP 3: Translate the question:
(a) About the shape/vertex?
(b) About solving/quad formula?
(c) A particular business application?

Practice from homework.

How would you start these problems

2.2/10: $f(x) = x^2 - 4x + 16$

$g(x) = -0.5x^2 + 4x + 10$

(d) Find all values of x at which

$g(x) - f(x) = 4.$

(e) Find the longest interval, starting at $x = 1$, over which $g(x) - f(x)$ is increasing.

(f) Find the longest interval over which $f(x)$ and $g(x)$ are both increasing.

(g) Find the interval on which $g(x)$ is greater than or equal to 15.

How would you start these:

2.3/2:
$C(x) = 21000 + 55x + 0.3x^2$ and
$R(x) = 425x - 0.7x^2$.
Find break even points.

2.3/7(d): For what range of quantities
is $AVC(q) = (1/30)q^2-(1/10)q+1$ at most
$0.55?

2.3/5:
Price per item is $p = 150 - 0.80x$,
Find the maximum revenue.

2.3/9(c): Give the longest interval on
which $TR(q) = -0.16q^2 + 24q$ and
Profit $= (-0.16q^2 + 24q) - (6q+175)$ are
both increasing

One More Big Example:

You sell Objects. Your finance specialist has analyzed your cost and given you the following:

$VC(q) = 0.01q^3 - 0.135q^2 + 0.6075q$

$MC(q) = 0.03q^2 - 0.27q + 0.6075$

$\quad$ FC = 90 hundred dollars

market price = p = 30 dollars/Object

q is in **hundreds of Objects**

VC is in **hundreds of dollars**

MC is in **dollars/Object** (as it always is!)

Question 0:

Find all the other business functions.

$TR(q) \quad =$

TC(q) $\quad =$

AC(q) =

AVC(q) =

Profit = P(q) =

For each of the following, how would you answer the question (don't finish the answer, just set up how you would do it):

1. Find the cost to make the 326th item?

2. Find when profit is zero (break even points).

3. For what quantities is TR = VC?
   (This is when you lose exactly as much as the FC)

Now let's forget the given market price
and do a general cost analysis.
4. What is break even price (BEP)?

5. What is shutdown price (SDP)?

Chapter 4 Motivational Example (from HW)

We will spend the next week building the skills needed to do a two variable problems (selling two products).

Some examples are shown. Initially these problems will seem daunting, but I will teach you to organize the data in tables and then the work will become routine. All we will need is basic line skills.

An example from HW in 4.2 "Newjet, Inc. manufactures inkjet printers and laser printers. The company has the capacity to make 490 printers per day, and it has 840 hours of labor per day available. It takes 1 hour to make an inkjet printer and 3 hours to make a laser printer. The profits are $90 per inkjet printer and $140 per laser printer.

Find the number of each type of printer that should be made to give maximum profit, and find the maximum profit."

Another Example from HW (4.2):
"A company manufactures two types of electric hedge trimmers, one of which is cordless.
The cord-type trimmer requires 4 hours to make, and the cordless model requires 10 hours. The company has only 2000 work hours to use in manufacturing each day, and the packaging department can package only 300 trimmers per day.

Write the inequalities that describe the constraints on the number of each type of hedge trimmer produced. (Let x = number of cord-type models, and let y = number of cordless models.)"