

Closing Tuesday: 2.1

Closing Thursday: 2.2 and 2.3(part 1)

**Warning:** You should already be done with 2.1. Attempt all of 2.2 by tonight! And start to look at 2.3. Ask lots of questions in quiz section tomorrow.

## 2.2 Rates with Formulas (continued)

Recall our example from last time:

$t$  = hours

$$D(t) = 144t - 18t^2 = \text{distance in miles}$$

Last time, we noted that the formula for average trip speed is:

$$\text{ATS}(t) = \frac{D(t)}{t} = \frac{144t - 18t^2}{t} = 144 - 18t$$

Now we discuss *incremental rates*:

*Entry Task:*

- (a) Find the car's average speed from  $t = 2$  to  $t = 4$ ?
- (b) Find the average speed over the 0.1-hour interval starting at  $t = 2$ .

- (c) Find the general formula for the average speed over the 0.1-hour interval starting at  $t$ .
- (d) Find the general formula for the average speed over the  $h$ -hour interval starting at  $t$ .

## 2.3 Quadratic Business Applications

Example: You sell Things.

*Costs Info:*

Each Thing costs \$6 to produce and you have fixed costs of \$20.

*Revenue Info:*

The price per Thing is given by a linear (demand) function of quantity;

You will charge \$8 per Thing for an order of 7 Things and \$20 per Thing for an order of 1 Thing.

Find the ...

- (a) price function.
- (b)  $TR(q)$ ,  $TC(q)$  and profit functions.
- (c)  $MR(q)$  and  $MC(q)$  functions.

- (d) At what quantities is profit zero?  
(*i.e.* you break even)
- (e) At what quantity is profit maximized?

## Random Problems from Homework:

**2.2/2:** Find the average rate of change of  $y = 9 + 5x + 0.5x^2$  between  $x = 4$  and  $x = 6$ .

**2.2/4:** Let  $f(x) = 5 + x + x^2$  and  $h \neq 0$ . Find and simplify  $\frac{f(x+h)-f(x)}{h}$

**2.2/6:** Let  $f(x) = 8x^2 - x + 7$  and  $h \neq 0$ . Find and simplify  $\frac{f(x+h)-f(x)}{h}$

**2.2/8 and 9:** Just like example from class. Here is part of 9:

$$D(t) = 2t - 0.04 t^2$$

Find a formula for the car's average speed during the 2-minute interval beginning at time  $t$ .

**2.3/2:**

$$C(x) = 21000 + 55x + 0.3x^2 \text{ and}$$

$$R(x) = 425x - 0.7x^2.$$

Find break even points.

**2.3/7(d):** For what range of quantities is

$$AVC(q) = (1/30)q^2 - (1/10)q + 1 \text{ at most}$$

\$0.55?

**2.3/5:** Price per item is  $p = 150 - 0.80x$ , **2.3/9(c):** Give the longest interval on

Find the maximum revenue.

which  $TR(q) = -0.16q^2 + 24q$  and

Profit =  $(-0.16q^2 + 24q) - (6q + 175)$  are

both increasing

**2.3/8,9:**  $TR(q) = -0.25q^2 + 30q$

$$TC(q) = 17.5q + 100$$

(a) Find MR and MC formulas

(b) Find AR and AC formulas