

First Midterm Exam Answers

1. *GoogleStock_a.*

- (a) The market value is the number of shares times the price per share, or $\$338 \times 315.29$ million = 106,568 million, i.e. \$106.6 billion.

Earnings per share are total earnings divided by the number of shares, or $\$4,226.86$ million \div 315.29 million = \$13.40.

The price/earnings ratio is then $338/13.40 = 25.2$, which is very high by historical standards.

- (b) The discounted present value of the two earnings streams is

i. $\frac{6000}{1.10} + \frac{9000}{1.10^2} + \frac{15000}{1.10^3} = 24,162.28$

ii. $\frac{4800}{1.10} + \frac{5400}{1.10^2} + \frac{6200}{1.10^3} = 13,484.60$

Dividing by the number of shares gives the 3-year DPV per share, \$76.63 for (i) and \$42.77 for (ii). Obviously both of these are much lower than the current share price of \$338, but that price includes the additional DPV of earnings beyond the 3-year time horizon.

It seems unlikely that (ii) could be consistent with the current price unless analysts expect Google earnings to “hockey-stick” after the 3-year mark. But earnings stream (i) is about on track to add up to the current share price, so it is the most likely.

2. *Lawns.*

- (a) Writing the formula for elasticity on a linear demand curve and working backwards gives:

$$|\varepsilon| = 1.5 = b \frac{p}{q} = b \frac{1.2}{0.33} \Rightarrow b = 0.4125$$

Now that we know the slope, the intercept can be found by making sure the line goes through the point we identified:

$$q = a - bp \Rightarrow 0.33 = a - 0.4125 \times 1.2 = 0.33 \Rightarrow a = 0.825$$

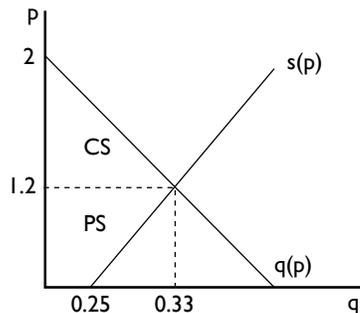
Thus, the demand curve is $q(p) = 0.825 - 0.4125p$.

(b) Setting demand equal to supply gives

$$0.825 - 0.4125p = 0.25 + 0.067p \Rightarrow 0.575 = 0.4795p \Rightarrow p = 1.20$$

The corresponding quantity, using the demand curve, is $q(1.2) = 0.33$.

(Not surprisingly, we picked this point as the equilibrium on purpose.) To find consumer and producer surplus, it's probably easiest to draw the graph, finding the choke price and the supply intercept:



Then the area of CS is $\frac{1}{2}(2 - 1.2)0.33 = 0.132$. The area of PS involves a rectangle and a triangle added together:

$$.25 \times 1.2 + \frac{1}{2} \times 1.2 \times (0.33 - 0.25) = 0.348.$$

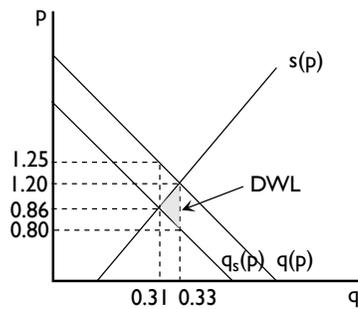
(c) The private demand curve is $q(p) = 0.825 - 0.4125p$. If we invert it, we get the private benefits of a quantity q of lawn:

$p(q) = 2 - 2.42q$. But now it turns out that there is a \$400 social cost that needs to be subtracted off, so we subtract 0.4 from the above: $p_s(q) = 1.6 - 2.42q$. Now to get back to a regular demand curve, we need to invert again: $q_s(p) = 0.66 - 0.4125p$.

- (d) Essentially, we need to repeat part (b) with the new demand curve. Setting demand equal to supply gives

$$0.66 - 0.4125p = 0.25 + 0.067p \Rightarrow 0.41 = 0.4795p \Rightarrow p = 0.86$$

The corresponding quantity, using the social demand curve, is $q_s(0.86) = 0.31$. Again, to find deadweight loss it's probably easiest to draw the graph. That shows that one important point to know is the price that makes social demand equal to 0.33, which is $p_s(0.33) = 0.80$.



The area of the deadweight loss is

$$\frac{1}{2}(1.2 - 0.80)(0.33 - 0.31) = 0.004, \text{ or about } \$4 \text{ per household.}$$

- (e) Since the tax would be levied directly on the household, it would shift the private demand curve exactly to the social demand curve. The private demand curve at $q = 0.31$ gives a price of 1.25, so the tax revenue would be $(1.25 - 0.86)0.31 =$ or \$0.1209 thousands, i.e. \$120.90 for the average household.