

Mid-Term Exam—Answer Sheet

Below you will find the answers to the mid-terms as well as a listing of some common mistakes that students made in trying to answer the questions.

Problem #1. True, False, Uncertain

1a) FALSE. CD-RW disks are clearly not demand substitutes for CD-RW drives: people will not switch from disks to drives when the price of disks goes up. (On the contrary, these products are complements). They are also not supply substitutes neither: producers of drives would not typically switch to the production of disks just because the price of disks went up. (These are very different technologies, so drive producers are not the most natural entrants in the disk market.)

(Note : given how little we focused on it in class, it is not necessary to talk about supply substitutes to get full credit.)

Common Mistakes:

- CD-RW drives and disks are complements and therefore in the same market – Not true, markets are not defined by complements but by substitutes. Although when two products are complements (e.g. gas and cars) the markets are linked the products are not in the same market because there is no supply or demand substitutability.
- Two products are in the same market if they are demand substitutes –Partially true, however it is better to state that two products are in the same market if they are demand or supply substitutes.

1b) UNCERTAIN or FALSE, depending upon explanation. Optimal production will be at the point where marginal cost equals marginal revenue. This will in general not be the point of minimal average cost. It might be the point of minimal average cost by pure coincidence: if the marginal cost, average cost, and marginal revenue curve all intersect each other at the same point.

Common Mistakes:

- Marginal cost equals marginal revenue imply minimal average cost – Not true, MC crosses the average cost curve at the minimum average cost point but this does not mean that profits are optimized at that point. For example if at the minimum average cost level, producing one extra unit generates more revenue than cost (hence $MR > MC$) than the monopolist should produce this unit as it will increase their profits even if this means higher average cost.
- In the long run a monopolist will produce at minimum average costs – Not true, in the short as well as in the long run the monopolist optimizes its profit by producing at the point where $MR = MC$ and this does not imply lowest marginal cost.

Problem #2.

a) The User Cost of Capital for each type of tractor is as follows:

UCC for 1-year use of new tractor = $(100,000 - 70,000) + 10\% * 100,000 = \$40,000$

UCC for 1-year use of 1-year-old tractor = $(70,000 - 45,000) + 10\% * 70,000 = \$32,000$

UCC for 1-year use of 2-year-old tractor = $(45,000 - 0) + 10\% * 45,000 = \$49,500$

b) Since variable cost is the same for all types of tractors, and there is no cost of reselling, each year Old McAdams should use whatever tractor has the lowest UCC. Hence, the best plan is to purchase a 1 year old tractor at the start of each year and sell that tractor (now 2 years old) at the end of each year.

Common Mistakes:

- Wrong UCC formula. $UCC(t) = r * V_t + Depr = r * V_t + (V_t - V_{t+1})$. Typical mistakes include using $(1+r)$ instead of r or using $r * V_{t+1}$ instead of $r * V_t$.
- Not noticing that, thanks to the liquid market, you could just buy and resell each year your favorite type of tractor.

Problem #3.

Tinysoft Promotional Campaign

Given: Total Quantity=20 million

Constant MC = \$10

Price = \$65

Discount rate = 10%

2 periods

Choice: Spend \$100 million this period and capture 50% of the market next period.

vs. Spend \$310 million this period and capture 70% of the market next period.

a) Which promotional campaign should Tinysoft pursue?

Objective: Compare the net present value of the two campaigns:

Note that for each product sold, the company will earn \$55 (P-MC).

$$NPV_1 = -100 \text{ million} + \frac{0.5 * 20 \text{ million} * 55}{1 + .1} = -100\text{m} + 500\text{m} = \$400 \text{ million}$$

$$NPV_2 = -310 \text{ million} + \frac{0.7 * 20 \text{ million} * 55}{1 + .1} = -310\text{m} + 700\text{m} = \$390 \text{ million}$$

$NPV_1 > NPV_2$ so Tinysoft should choose the \$100 million dollar campaign.

b) With the network externality, as more consumers use the product the value of the software for others increases, prompting them to purchase the software, and so on. Now instead of 70% of the market, the \$310m campaign captures 100% of the market.

Again, compare the net present value of the two campaigns:

$NPV_1 = \$400$ million as in part a).

$$NPV_2 = -310 \text{ million} + \frac{1 * 20 \text{ million} * 55}{1 + .1} = -310m + 1000m = \$690 \text{ million}$$

$NPV_2 > NPV_1$ so Tinysoft should choose the \$310 million dollar campaign.

c) Before production, price falls to \$5. The CEO states:

“Though these are hard times, we stay committed to our product. We will not let our efforts and our promotional campaigns go to waste!”

As a consultant to Tinysoft, you should point out:

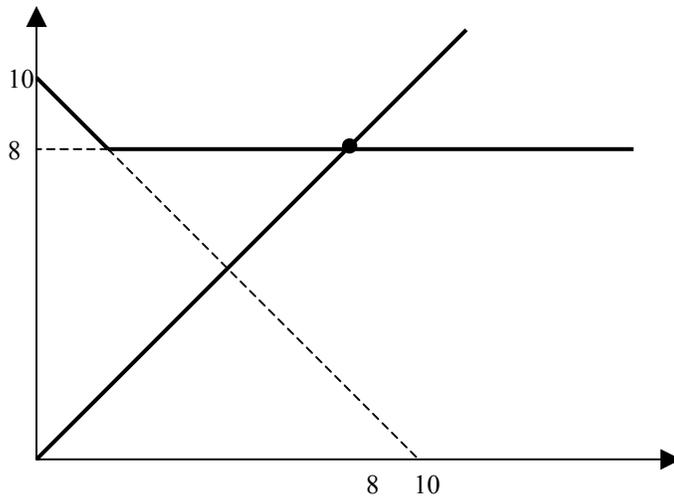
1. The promotional campaign is a SUNK cost: it does not vary with output and cannot be recovered. This should not enter your production decisions.
2. The marginal cost (\$10) is now greater than what you can sell the product for (\$5). You would lose money on every product produced. Instead of staying committed to the product, it only makes sense not to produce.

Common Mistakes:

- 3a) The most common problem was to forget to discount your next period profits. Another common mistake was to forget to include the marginal cost of \$10 per unit or to assume that it was incurred this year instead of next year.
- 3b) Regarding the effect of the network externality, some people incorrectly adjusted the first campaign to this effect: a network externality can increase your market share when you have a dominant position but not in the case that you are equally splitting the market with a competitor, as it is the case in the first campaign.
- 3c) Many people mistook the CEO’s quote as a NPV analysis problem with network externalities. Instead, once a company has invested in advertising (a sunk cost), the decision to produce going forward is based only on a comparison of Marginal Cost to Marginal Revenue. Advertising should be viewed as sunk costs and should not be used to make investment decisions. Some people identified Advertising as a sunk cost but did not highlight that for economic decisions, sunk costs should not affect production decisions.

Problem #4.

a) The supply-demand diagram is as follows.

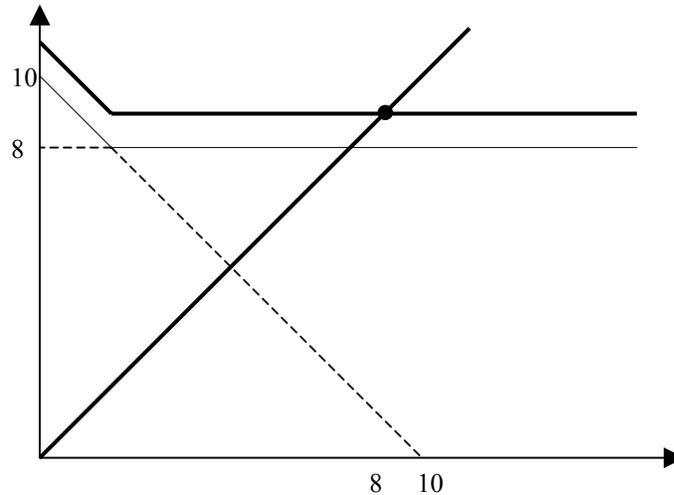


Equilibrium price is 8 dollars per pound, quantity is 8 million pounds, consumer surplus is $(2 * 2 / 2 =)$ 2 million dollars, producer surplus is $(8 * 8 / 2 =)$ 32 million dollars.

Common Mistakes:

- Some people solved the problem, as if there are two separate independent markets for human and for animal broccoli consumptions.
- Some people combined demand for the two markets incorrectly.
- Some people did not draw supply curve at all or assumed that it perfectly elastic or inelastic.

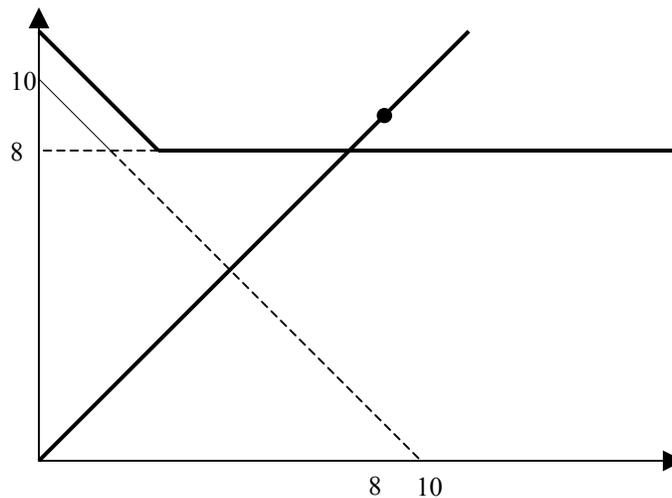
b) With a \$1 subsidy for all consumption, the new graph is as below. The new equilibrium price is \$9 per pound, while the new quantity is 9 million pounds. The cost of the subsidy is 9 million dollars. Consumer surplus is unchanged at 2 million dollars. Producer surplus is now 40.5 million dollars. The change in total surplus is $40.5 + 2 - 9 - 32 - 2 = -.5$ million dollars. Deadweight loss is thus .5 million dollars.



Common Mistakes:

- Continuing to solve for two separate markets or an incorrectly combined demand curve.
- Assuming no DWL or calculating DWL incorrectly (usually double counting).
- Forgetting to answer all parts of the question: Q, P, Cost of Subsidy, & DWL.

c) The new graph is below.



The equilibrium price is \$8 per pound, while the quantity is 8 million pounds. Since human consumption accounts for 3 million pounds, the total government subsidy is 3 million dollars. Producer surplus is identical to (a), but consumer surplus is now $(3 * 3 / 2 =)$ 4.5 million dollars. The deadweight loss is again .5 million dollars.

Common Mistakes:

- Continuing to solve for two separate markets
- Incorrectly combined demand curve (e.g., sum vertically rather than horizontally)
- Ignoring market for animal broccoli consumption.
- Assuming no DWL .

Problem #5.

There are three acceptable answers, depending upon how the cost equation is implemented. There are two natural ways of computing approximate changes coinciding with the log-log equation, and then there is an exact solution where logarithms are computed directly.

Method 1 (Lower output as base). Both your current production and your cumulative production are $(25-20)/20 = 25\%$ higher than that of your competitor. Your average costs are therefore $(0.2+0.3) * 0.25 = 0.5 * 0.25 = 12.5\%$ lower than those of your competitor.

Method 2 (Higher output as base). Both your competitor's current production and his cumulative production are $(25-20)/25 = 20\%$ lower than yours. Your average costs are therefore $(0.2+0.3) * 0.2 = 0.5 * 0.2 = 10\%$ lower than those of your competitor.

Method 3. (Exact calculation) Following the same reasoning but now calculating the logs exactly gives $(0.2 + 0.3) * \log(25/20) = 11.2\%$ lower costs than your competitor.

Common Mistakes:

- Using a scale advantage of 5% instead of $25\%-20\%/25\% = 20\%$ (or $25\%-20\%/20\% = 25\%$)
- Multiplying the scale advantage by only the learning factor (0.3) or the scale factor (0.2), not both.
- Simply using 'plug and chug' for an 'assumed market size', i.e. picking values for the equations, calculating AC1 and AC2, and then comparing the values. This is not general and therefore incorrect (unless you argued why that would also give you the correct result for other market sizes, i.e. that rescalings go into the intercept).