

**Economics 101**  
**Fall 2012**  
**Homework #4**  
**Due 11/20/2012**

**Directions:** The homework will be collected in a box **before** the lecture. Please place your name, TA name and section number on top of the homework (legibly). Make sure you write your name as it appears on your ID so that you can receive the correct grade. Please remember the section number for the section you are registered, because you will need that number when you submit exams and homework. Late homework will not be accepted so make plans ahead of time. Please **show your work eligibly and neatly**; otherwise you will not receive full credit. Good luck!

**1. Consumer Price Index**

The table below shows the prices of the only three commodities traded in Shire.

Year	1995	2000	2005	2010
Potatoes	\$1/lb	\$2/lb	\$3/lb	\$4/lb
Pork	\$20/lb	\$25/lb	\$30/lb	\$40/lb
Beer	\$7.5/keg	\$12/keg		\$25/keg
CPI		100	140	

Suppose the typical Hobbit in a year buys 200 pounds of potatoes, 50 pounds of pork and 50 kegs of beer (that is, consider this the “market basket”). Use this information and the data in the table to answer the following questions.

- Complete the table.
- Compute the inflation rate from 1995 to 2010.
- Calculate price changes for each commodity from 1995 to 2010 measured as percentages.
- Compare the individual price changes with the overall inflation rate. What are your observations when you compare these two things?

**2. Consumer Theory – Income and Substitution Effects**

$Q_X$	1	2	3	4	5	6	7	8	9
$MU_X$ (measured in utils)	72	36	24	18	14.4	12	10.28	9	8
$Q_Y$	1	2	3	4	5	6	7	8	9
$MU_Y$ (measured in utils)	72	36	24	18	14.4	12	10.28	9	8

Garfield only consumes two goods fish (X) and candy (Y). Through careful negotiation with Jon, Jon agrees to spend \$72 dollars per week to buy Garfield these two goods and Garfield can choose whatever bundle he prefers. One can of fish costs \$9 and one pack of candy costs \$6. The table above shows some of his marginal utilities relating to his consumption of these two goods.

- a) Find the equation for Garfield's budget constraint and graph it.
- b) What is Garfield's utility maximizing bundle at this budget constraint? What's his total utility from consuming this bundle?
- c) Suppose the price of fish decreases to \$4 per can. Find the equation of Garfield's new budget line and graph it in the same diagram as in a).
- d) What is Garfield's utility maximizing bundle given his new budget line? What is the change in his consumption of good X?
- e) Observe the table carefully. What other consumption bundle from this table gives Garfield the same utility level as he got at point A (the amount you calculated in (b))? Once you have found this point label it point C on your graph and draw an indifference curve that contains both point A as well as point C. Label this indifference curve  $IC_1$  in your graph.
- f) How much money would Garfield need from Jon to afford this bundle C? Why will Garfield need less money to afford this bundle than he needed to afford bundle A?
- g) Verify that the consumption bundle you found in (e) is the utility maximizing bundle for the level of income you determined in (f). This new level of income is based upon the new price of fish.
- h) What is Garfield's imaginary budget line? Graph it in the same diagram and label it BL3.
- i) Identify graphically and numerically how much of the change in Garfield's consumption of fish is due to the income effect and how much of the change is due to the substitution effect?

### 3. Consumer Theory – Utility Maximization

Let Abe's utility function be  $U(X,Y)=XY$ , where X is an quantity of good X consumed and Y is the quantity of good Y consumed. The marginal utility from consuming X is  $MU_x=Y$  and marginal utility from consuming Y is  $MU_y=X$ . (For those of you have learnt about calculus and differentiation, you will recognize that these are the first derivatives with respect to X and Y respectively).

- a) Fill out the following table and graph these two indifference curves. For example, on line 1 of the table you have that  $U(X, Y) = 10$ . So since  $U(X, Y) = XY$  you have  $XY = 10$ . What combination of X and Y will make this equation true? An infinite number of combinations: for example, when  $X = 1$  and  $Y = 10$  then  $XY = 10$ .

U(X,Y)=10	X	1	2		5	
	Y			2.5		1
U(X,Y)=20	X	1		4	8	20
	Y		10			

Suppose  $P_x = \$2$  and  $P_y = \$2$  and Abe has income of \$20.

- Which consumption bundle of X and Y would Abe choose? What's his total utility at this bundle?
- Suppose the government decides to levy an excise tax of \$1 per unit on good Y. What's Abe's budget constraint now that he is facing this tax?
- Which consumption bundle would Abe choose now that this tax on good Y has been implemented? What's his total utility at this bundle?
- What is the tax revenue collected by the government given the tax on good Y described in (c)?
- Now assume that instead of the excise tax on good Y, the government wants to impose an income tax. To generate the same tax revenue, what must be the income tax rate?
- Facing this income tax, what consumption bundle would Abe choose? What's his total utility when he maximizes his utility given the income tax?
- Comparing your answers from (d) and (f), which tax would Abe prefer? Why?
- For the previous part we did not specify what the government would do with the tax revenue collected. If the government plans to give the tax revenue collected back to Abe as a lump-sum subsidy, which tax do you think Abe would prefer now? Briefly explain your answer.

#### 4. Production and Cost

Suppose you are making muffins for a party. First you need to buy an oven, which cost you \$x. And for each cupcake, you use one pouch of cake mix, each cost you \$y. Besides, you need time to do it, the opportunity cost for your labor is \$z/minute.

Quantity	Time (minute)	MPL $\Delta Q/\Delta T$	VC	FC	TC	AVC	AFC	ATC	MC
0	0	---				---	---	---	---
1	15	1/15	17		47				
2	20		24						
3	24	1/4							
4	30		38						
5	40								
6	60								

- From the information given, find out x, y and z, and complete the table.
- According to the table, at what level of quantity does average cost (ATC) attain its minimum?
- Over what range of outputs do you experience diminishing returns to your labor?
- From the class lecture we know that MC intersects ATC at its minimum point. From the table determine a range of quantities for where this point of intersection will occur.

#### 5. Perfect Competition

Suppose the market for Android smart phones is perfectly competitive. All firms are identical with the same cost functions:  $TC=q^2+80q+100$ ,  $MC=2q+80$ , (q is the quantity produced by a representative firm). The market demand is  $P=150-Q$ . (Q is market quantity).

- Given the above information: find the equation for FC, VC, TC, ATC, and AVC. In a graph draw the ATC, AVC, and MC curves.
- Determine q, P and the number of firms in the long run.
- Calculate the value of profits for a representative firm in the long run?
- Derive the market supply curve. (Hint: use your MC curve to find another point on the firm supply curve: when  $q = 0$ , then  $MC = 80$ . So, when price is 80, the quantity produced by a representative firm is 0 units and therefore the market quantity is also 0 units.)

Suppose that Apple introduces the iPhone 6. This causes a negative demand shock of 28 units at every price in the market for android phones.

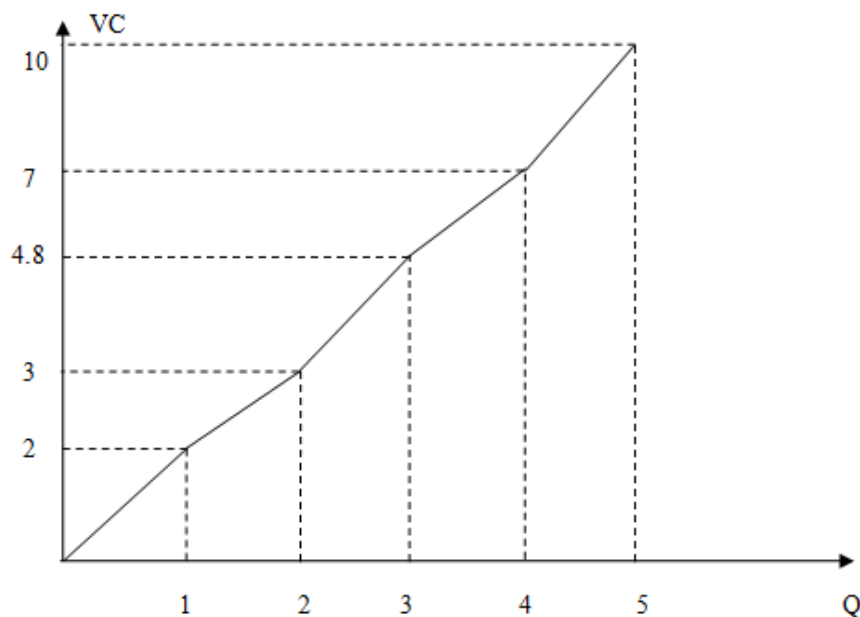
- e) In the short run, we know that the number of firms in the market doesn't change. So given the change in market demand how many android phones will a representative firm now produce in the short run? (Hint: start by writing the new market demand curve, and then think about where the new short-run equilibrium is in this market.)
- f) Calculate the short run profit for a representative firm. Given this profit calculation what do you predict will happen in the long run, holding everything else constant?

Go back to the time before iPhone 6. Suppose another change take place: there's a new technology for making phone chips. This new technology causes the marginal cost to decrease by \$28 per unit and the fixed cost to increase by \$96.

- g) Given this information, what is the TC function for a representative firm now? What is the MC function for this representative firm? What is the market supply curve in the short run? Given the new TC and MC equations as well as the market supply curve, calculate  $P$ ,  $q$ ,  $Q$ , and short run profits for a representative firm. Will firms exit or enter this industry in the long run?
- h) In the long run and holding everything else constant, how many firms will there be in the market? (Remember that we are now looking at the new TC curve as well as the new MC curve for the representative firm.)

## 6. Perfect Competition

Albert Bros Doughnuts produces doughnuts and it's a price taker in the market. It has to pay \$1 of rent every day it operates as a business. The following graph shows its variable costs per day for the production of doughnuts ( $Q$  is the number of doughnuts).



- a) At what quantity does Albert Bros Doughnuts' have its lowest ATC? At what quantity does Albert Bros Doughnuts' have its lowest AVC?
- b) Suppose that the market price for doughnuts is \$2.10 per doughnut. In the short run, will Albert Bros Doughnuts earn a positive, negative, or zero economic profit? In the short run, should the firm produce or shut down? In the long run, holding everything else constant, do you expect this firm to continue to produce or to exit the industry? Explain your answer.
- c) Suppose that the market price for doughnuts is \$1.70 per doughnut. In the short run, will Albert Bros Doughnuts earn a positive, negative, or zero economic profit? In the short run, should the firm produce or shut down? In the long run, holding everything else constant, do you expect this firm to continue to produce or to exit the industry? Explain your answer.
- d) Suppose that the market price for doughnuts is \$1.30 per doughnut. In the short run, will Albert Bros Doughnuts earn a positive, negative, or zero economic profit? In the short run, should the firm produce or shut down? In the long run, holding everything else constant, do you expect this firm to continue to produce or to exit the industry? Explain your answer.