Problem Set # 2

1) **[10 points]** The Case-Shiller Housing Price Index has become a standard reference to track home prices. In Miami, for example, the Case-Shiller Index reached a peak of 281 in December 2006. Since that time, demand for homes has fallen sharply and the Case-Shiller Index in June of this year stood at 146 – a fall of about 48% in average home prices.

Over the same years, demand for new cars has also fallen but the price of new Ford sedans has only fallen by about 5%.

Use the concept of elasticity of the supply curve to explain why falling demand has caused a very large percentage price drop for homes but a much smaller price drop for new cars.

Answer: The difference between the examples is that we are talking about "new" cars versus all housing. If demand falls for new cars, Ford can just stop producing new cars. In other words, the supply curve of **new** cars is very elastic and responds to falling demand through changing quantity rather than price.

The supply of homes for sale is pretty much the opposite. There is some elasticity of supply since those potential sellers with some flexibility can postpone selling their homes. But basically, the supply curve of homes is very inelastic and so the market will respond to falling demand largely through price declines. (If the Case Shiller Index had focused on prices of new homes rather than sale prices for all homes, the price fall would have been much less dramatic since new home production, like new car production, had largely stopped.
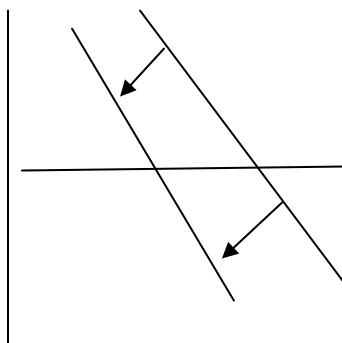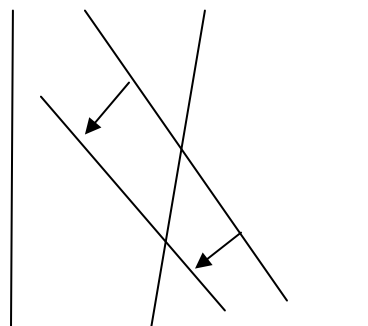

New cars   homes for sale

2) [**20 points**] Suppose that the current market equilibrium price of soft white wheat is $6.50 a bushel. Congress holds hearings and says that this price is too low for family farms to survive. It passes legislation to authorize the Department of Agriculture to buy and hold as many bushels of soft white wheat as farmers want to sell at a price of $7.50 per bushel.

Draw the supply/demand equilibrium for wheat without the relief plan and with the relief plan. On your diagram, show under the relief plan how much (if any) soft white wheat will be purchased by private consumers, how much (if any) will be purchased by the Department of Agriculture, the revenue received by farmers, and the total cost to the taxpayer.
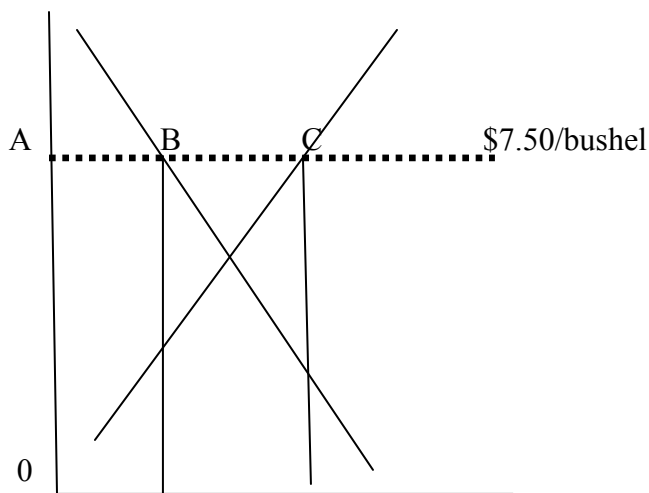
The diagram above begins by understanding that if the government is supporting the price at $7.50, farmers will produce wheat as if the price is $7.50. The original equilibrium where the supply curve crossed the demand curve is now irrelevant.

Wheat purchased by consumers = A-B

Wheat purchased and stored by the Government = B-C

Revenue collected by farmers = $7.50*C   - i.e. the support price multiplied by their total production.

Revenue paid by consumers = $7.50*(A-B)

Total Cost to Taxpayers = Revenue Paid by the Government = $7.50*(B-C)

(I am using * here as the multiplication sign.)

3) [**25 points**] We noted in class that a straight line demand function has a constant slope but it doesn't have a constant elasticity. In this problem, you will demonstrate that as well the relationship between elasticity and revenue. Since the problem has a few multiplications, it will go faster if you use a calculator or a spreadsheet.

Begin with the demand function: $Q^D = 1,000 - 20P$

To make sure you understand the function, sketch it out as a demand curve paying attention to where the demand function intersects the vertical (Price) axis and where it intersects the horizontal (Quantity) axis.

In class, we said that the formula for elasticity was $e = (\Delta Q/Q_1)/(\Delta P/P_1)$ – i.e. the percentage change in quantity per one percent change in price. By rearranging terms, this becomes: $(\Delta Q/\Delta P)*(P_1/Q_1)$. Note that the first part of this expression - $(\Delta Q/\Delta P)$ – is the slope of the demand function which you should be able to read off of the equation above.

   a) Using your sketch of the demand curve, identify the values of Q and P associated with the point half-way down the demand curve. Then choose two points (i.e. the Q and P for each point) on the demand curve that lie to the left of the half-way point (higher prices) and two points (both Q and P) on the demand curve that lie to the right of half-way point (lower price).

   b) Calculate the value of the demand elasticity at each of the four points you have selected.

   c) Calculate the revenue at each of the four points. Then let the price fall by $1.00, calculate the new quantity at the lower price and calculate the new revenue at this lower price and quantity.

   d) Use the numbers you now have to demonstrate the following proposition:

       When demand is elastic (e < -1.0), reducing the price to sell more will increase revenue. When demand is inelastic (-1<e<0), reducing the price to sell more will decrease revenue. .
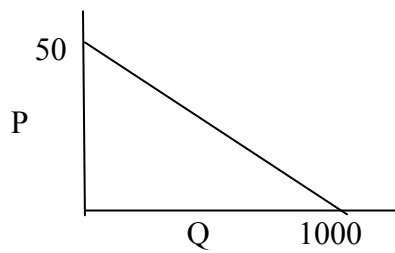

Answer: If we are to graph this, it is convenient (but not necessary) to rearrange terms to that P is on the left hand side (does not make economic sense but coincides with the fact that P is the vertical axis)

$$P = 50 - .05* Q^D$$

Rest of the problem is basic calculation.

So the graph has a vertical intercept at P = $50 and a horizontal intercept at 1,000.

Answer:

The midpoint is P = 25, Q = 500

So we might choose:

	Q	Elasticity	Revenue	Revenue (P - $1.00)
Higher Points = P = 40	200	-4.0	$8,000	$8,580
P = 30	400	-1.5	$12,000	$12,180
Lower Points: P = 20	600	-.6667	$12,000	$11,780
P = 15	700	-.4287	$10,500	$10,080

4) [**15 points**] During the Industrial Revolution, technical change worked *against* skilled labor. In the production of cloth, for example, large, water-powered looms tended by former farm laborers displaced skilled weavers who had worked on hand looms individually in their homes.

For most of the 20'th century, however, technical change favored skilled workers in a monotonic way – i.e. the more educated you were, the more demand shifts favored you.

Briefly explain how post-1985 computer-driven technical change requires some modification of this picture. If possible, include one or two specific occupations to illustrate your answer.

Answer: In the pure model of skill-biased technical change, the more education you had, the greater the demand there was for your services. That would be the case with, for example, the mechanization of agriculture where machines replaced agricultural laborers. Computers, however, cannot replace the least skilled workers, but rather replace occupations exercising routine cognitive skills – clerks, bank tellers, ticket agents, etc. The least skilled workers (as we usually define them) perform **non-routine** physical tasks – e.g. a janitor walking into a strange room and turning the photons that hit his two dimensional retina into a three dimensional understanding of the room. These and other physical acts are "hard wired" into humans but very hard for computers to do. As a result, the biggest substitution of computers for people occurs in the lower middle of the

distribution rather than the bottom, a somewhat different picture than standard earlier periods of technical change.

5) [**30 points**] You have a utility function of the form:

$$U(A, H) = 10LN(A) + 15LN(H)$$

The price of a hamburger is $3.00, the price of an apple is $0.50, and your income is $30.00.

In this problem, your job is to evaluate the potential solution:

Apples = 36; Hamburgers = 4.

a) By applying appropriate calculus to this utility function, derive the expression for the marginal utilities of apples and hamburgers, respectively. (We are looking for algebraic expressions here – not specific numerical values). The derivative of the LN function is contained in the calculus notes on the web site.

Answer: $\delta U/\delta A = 10/A$ $\delta U/\delta H = 15/H$

b) Take the expressions you derived in (a) and calculate the actual values of the marginal utility of apples and hamburgers at the proposed solution of Apples = 36 and Hamburgers = 4. Using the information on prices, determine whether the proposed solution satisfies the condition for utility maximization that (Marginal Utility/Price) be equal across all commodities. If (Marginal Utility/Price) is not equal across the two commodities, use your two calculated values of (Marginal Utility/Price) to explain whether this solution contains too many Apples or too many Hamburgers.

Answer: $(\delta U/\delta A)/P_A = (10/36)/.50 = .556$ $(\delta U/\delta H)/P_H = (15/4)/3.00 = 1.25$

Marginal Utility per dollar is higher in hamburgers than apples so the solution has too many apples and not enough hamburgers

c) Determine whether the proposed solution satisfies the other condition for utility maximization - that the proposed solution requires spending all income.

Answer: $36*\$.50 = 4*\$3.00 = \$18.00 + \$12.00 = \$30$.

d) In class, we developed formulae for both the slope of the budget line and the slope of an indifference curve. Using these formulae, calculate the slope of the budget line in this problem and then calculate the slope of the indifference curve at the point of the proposed solution: Apples = 36; Hamburgers = 4.

Answer: The Slope of the Budget Line = - Ph/Pa = - 6

The Slope of the Indifference Curve = - MUh/MUa = - (15/4)/(10/36) = -13.5

e) Sketch a set of axes that we use to describe the consumer choice problem with Apples on the vertical axis and Hamburgers on the horizontal axis. Put the budget line in the graph but don't draw indifference curves. Using the two slopes you calculated in (d), explain whether the proposed solution lies to "the Northwest" (i.e. too many Apples) or "the Southeast" (too many Hamburgers) of the utility maximizing solution. Does it square with your conclusion in (b)? Explain.

Answer: The slope of the indifference curve at this solution is more steeply negative than the slope of the budget line. This means it must cut the budget line to the "Northwest" of the utility maximizing solution which is consistent with the fact that this solution has too many apples.

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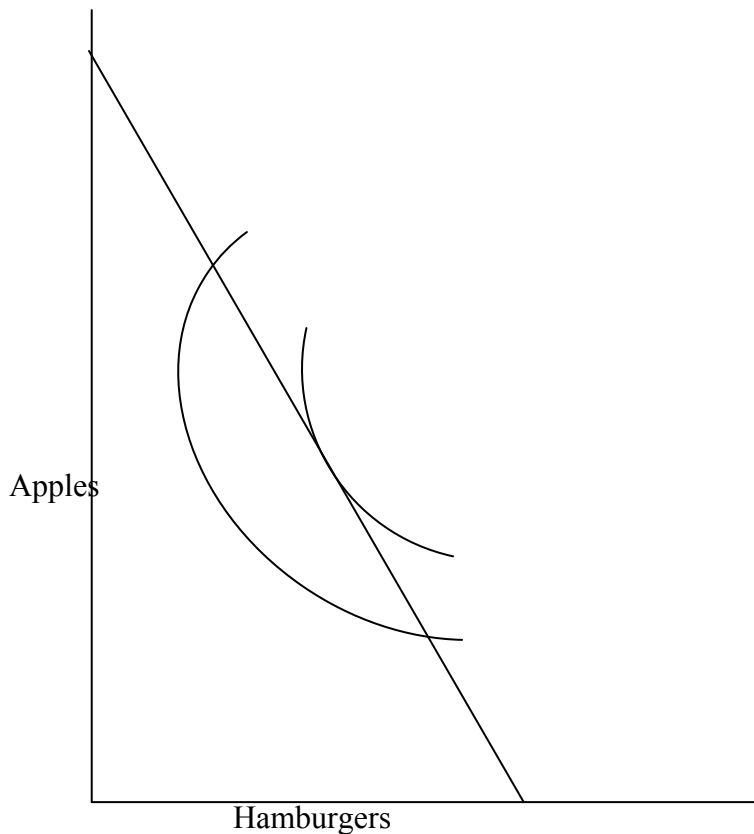
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