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Exam 1 Version 1.1 Answers

1. *A market for good X has 500 identical buyers with incomes of $1000 each and utility functions* $U = X^6Y^4$

The price of Y is currently $10 and the price of X is currently $5

a) (8 points) Calculate each individual's utility-maximizing consumption of X and Y.

The individual spends .6, or 60% of her income on X, so:
X = $600/price of x = $600/$5 = 120 units

The individual spends .4, or 40% of her income on Y, so:
Y = $400/price of Y = $400/$10 = 40 units

b) (8 points) What is the equation representing the individual's demand for X? (Assume $1000 income and Y at $10)

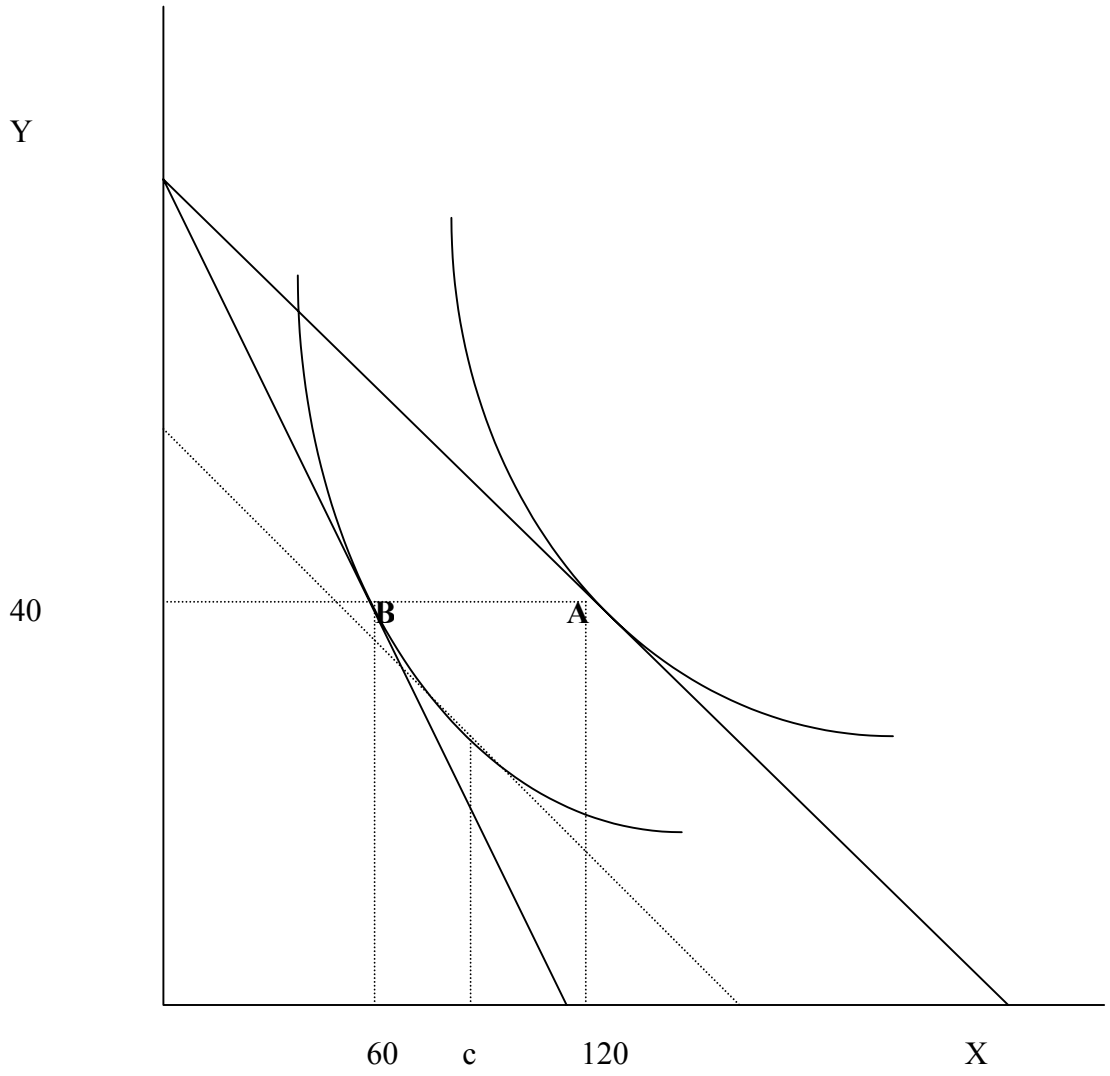
$$X = \frac{aI}{p_x} = \frac{.6(1000)}{p_x}$$

Now the price of X doubles (while income and price of Y remain constant)

c) (10 points) Illustrate the change in an individual's demand for X and Y, using two indifference curves and two budget constraints. Note:

--precisely plot two points, and identify their numerical coordinates: one point, A, should represent the individual's consumption before the price hike in X. The other point, B, should represent the individual's consumption after the price hike in X.

--carefully label the income and substitution effects of the price change on your graph.



The movement from 120 to c along the x-axis is the income effect. The movement from c to 60 along the x-axis is the substitution effect.

*d) (8 points) Precisely plot the **market** demand curve for X. Carefully label at least 3 points on the curve, including their numerical coordinates.*

At price of X = \$5, X = 120 for the individual. Since there are 500 identical buyers, they will buy X = 120 x 500 = 60000 units of X when the price of X is \$5.

Hence (\$5, 60000) is on the market demand curve.

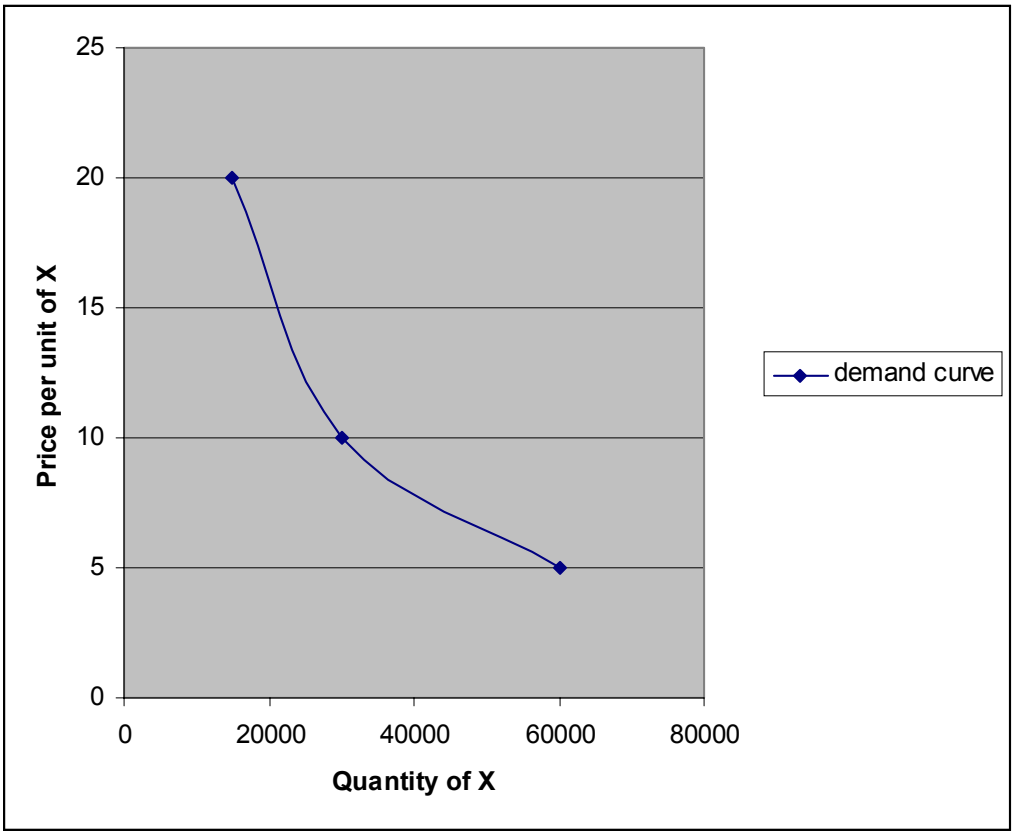
At price of X = \$10, X = 60 for the individual. Since there are 500 identical buyers, they will buy X = 60 x 500 = 30000 units of X when the price of X is \$10.

Hence (\$10, 30000) is on the market demand curve.

At price of X = \$20, X = 30 for the individual. Since there are 500 identical buyers, they will buy X = 30 x 500 = 15000 units of X when the price of X is \$20.

Hence (\$20, 15000) is on the market demand curve.

Plot the 3 points above. (You will not get a straight line.)



2. *A market is described by demand curve Qd = 1400 – 1.5P and supply curve Qs = -100 + .5P*

a) (8 points) Calculate the equilibrium price and quantity.

Qd = Qs
1400 – 1.5P = -100 + .5P
1500 = 2P
P = 750
Q = -100 + .5(750) = 275
Q = 1400 – 1.5(750) = 275

Now a price ceiling is imposed of $500

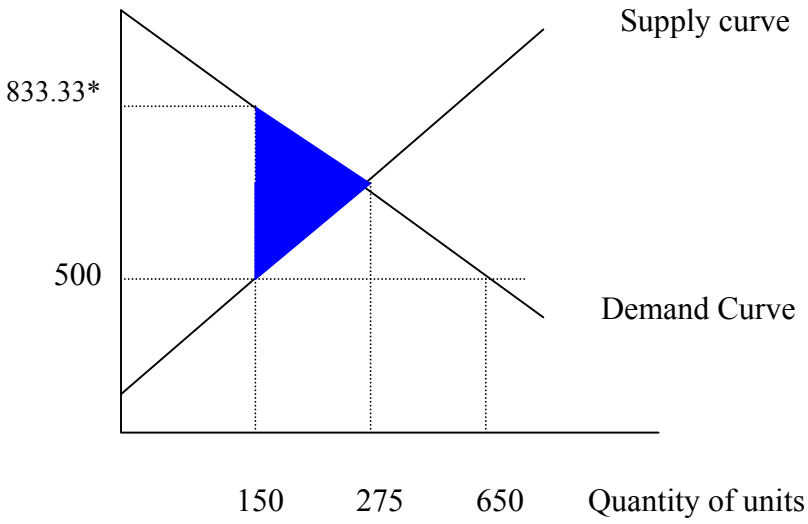
b) (8 points) Does this ceiling cause a surplus, or does it cause a shortage? Calculate the surplus or shortage. (Indicate whether it is a surplus or a shortage.)

Plug in P=500 into the demand and supply equations and calculate the difference:

Qd = 1400 – 1.5(500) = 650
Qs = -100 + .5(500) = 150

A shortage of 650 – 150 = 500

c) (8 points)Calculate the loss of efficiency (deadweight loss) resulting from the price ceiling.



*How do you get this number? This is the Price on the demand curve at a quantity of 150. So plug Q = 150 into the demand curve and solve for P:

Qd = 1400 – 1.5P
150 = 1400 – 1.5P
1.5P = 1250
P = 833.33

Deadweight loss = .5(275-150) x (833.33-500) = .5(125)(333.33) = $20833

3.A firm has demand curve Qd = 1000 – 5P for its product.

a) (8 points) Calculate the price elasticity of demand for this firm's product between $10 and $20.

At p = $10, Q = 1000 – 5(10) = 950
At p = $20, Q = 1000 – 5(20) = 900

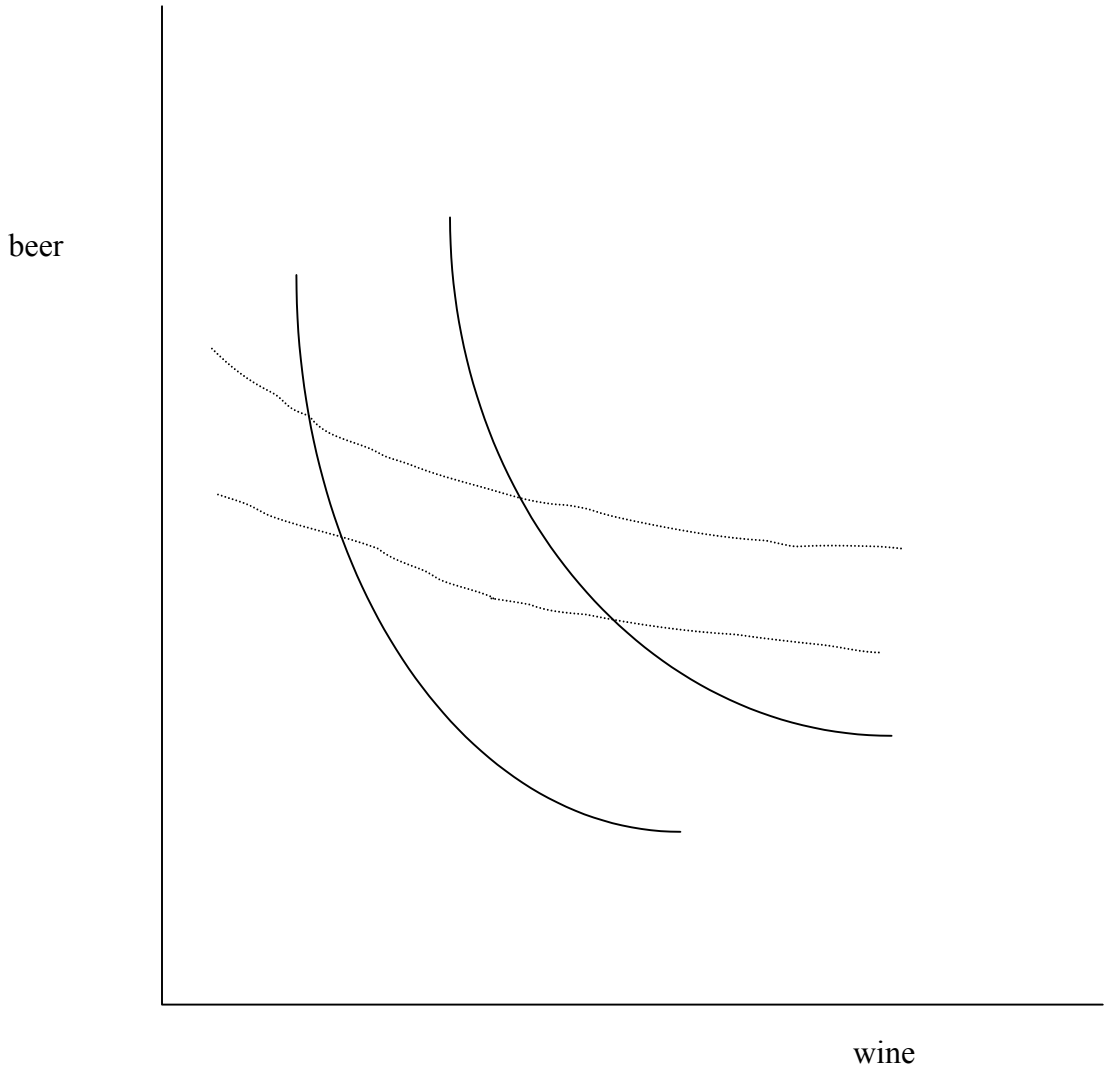
Using arc elasticity formula,

Ed = (950 – 900) / 925 / (20-10) / 15 = .081 (or -.081)

3. Both Zippy and Buffy like beer and wine. But Zippy likes beer a lot, while Buffy likes wine a lot.

a) (8 points) Draw a set of (two) indifference curves for Buffy and a set of (two) indifference curves for Zippy. Take care with the slopes of the curves.

The dashed curves are Zippy's. The others are Buffy's. Zippy's are flatter than Buffy's.



b)(8 points) If both Zippy and Buffy pay the same prices for beer and wine, will their marginal rates of substitution of beer for wine be the same or different? Carefully explain.

They will be the same, since under the utility-maximization rule, each individual sets his/her MRS equal to the price ratio of the two goods.

$MU_{beer}/MU_{wine} = p_{beer}/p_{wine}$ for both Buffy and Zippy

If each faces the same price ratio, then each's MRS will be equal.

4. *Suppose the income elasticity of demand for food is .5, and the price elasticity of demand is –1. Suppose also that in 1999 Goofy spends $20,000 per year on food, that the price of food is $4, and that his earned income is $50,000.*

In the year 2000 a $4 sales tax on food now causes the price of food to double. (Earned income, price elasticity, and income elasticity remain constant.)

a) (10 points) Calculate the change in Goofy's food consumption.

Since price elasticity of demand = -1, the (absolute values of) the percentage change in quantity demanded = the percentage change in price. Using the arc elasticity formula:

(Note: at a $4 price Goofy demanded $20,000/$4 = 5000 units of food)

% change in price = % change in Qd

(P2 – P1) / average of P1 and P2 = (Q1-Q2) / average of Q1 and Q2

($8-$4) / [($8+4)/2] = (5000 – Q2) / [(5000 +Q2)/2]

Solving for Q2 (which many people can do just by looking at the above equation--$4 is half as large as $8, so we need a Q2 half as big as 5000), we get

Q2 = 2500 so Goofy's food consumption has fallen to 2500 units—from 5000 to 2500

5. *Hal Tu Thowsind, fake economist, observes (with complete accuracy) that in the past year gasoline unit sales have remained precisely constant, despite a $.30 increase in gasoline prices. Based on this data, he claims "Demand for gasoline is completely price inelastic!"*

a) *(8 points) Refute Hal's claim. Discuss at least one other factor that can affect gasoline demand, and draw a graph illustrating your refutation. (Note: do not dispute Hal's data on gasoline sales; assume that they are accurate.)*

Higher gasoline production costs have pushed up its price; this is represented by a leftward shift of the gasoline supply curve. So why hasn't demand fallen? Because something has pushed up demand—the higher incomes made possible by the booming economy (represented by a rightward shift of the demand curve. The situation is graphed thusly: