Problem Set 1, due Tuesday, February 18ᵗʰ, 2014

Discrete demand

1. Suppose that Ariel's total benefit from coffee drinks per day is given by the table on the left.

coffee drinks	total benefit (willingness to pay)
1	$12
2	$17
3	$20
4	$21
5	$21

price range	quantity demanded
> $_____	0
$_____ - $_____	1
$_____ - $_____	2
$_____ - $_____	3
$0 - $_____	4

a) If the price of a coffee drink is $4.50, then how many should Ariel buy? _____
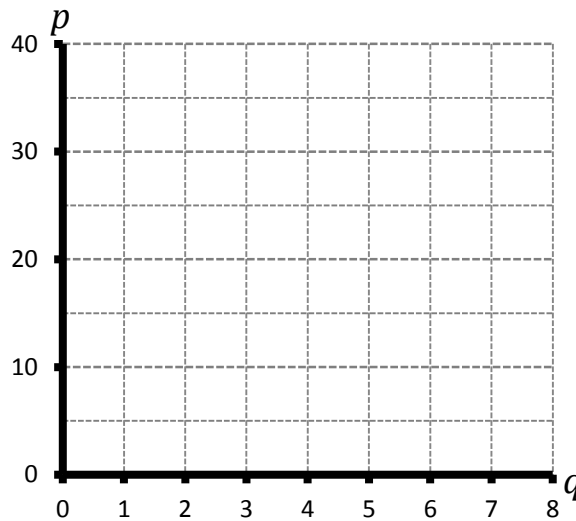
b) What will Ariel's consumer surplus be when the price is $4.50? _____

c) Fill in the missing spaces in the quantity demanded table (on the right) above.

2. The table below gives Stan's total benefit from DVDs in dollar amounts (TB), given the number of DVDs he buys (q). The price of DVDs is $20.

q	TB	MB		TE	CS
1	40				
2	71				
3	94				
4	110				
5	120				
6	125				
7	126				

a) Fill in the MB column with Stan's marginal benefit from each last DVD.

b) Fill in the TE (total expenditure) and CS (consumer surplus (cumulative)) column with Stan's total expenditure on DVDs and his consumer surplus.

c) On the blank graph above, draw Stan's demand 'curve' (actually more of a staircase shape), and a line representing the price. Shade the area that represents Stan's consumer surplus given the optimal quantity.

d) Using the information above, describe two distinct ways of determining the quantity of DVDs that is optimal (surplus-maximizing) for Stan to purchase, and explain why they are equivalent.

Continuous Demand

3. Suppose that Kristin's marginal benefit for cinnamon cereal is given by the function $MB = 10 - 2q$, where q is the quantity of cereal she consumes (in pounds).

a) If the price of cereal is $2 per pound, then Kristin should consume _____ pounds of cereal.

b) If she does this, her total consumer surplus will be _____.

c) Kristin's demand for cereal as a function of price is $q_d = $ _____ − _____p

4. Suppose that Billy's marginal benefit for lentil soup is given by the function $MB = 30 - 3q$, where q is the quantity of soup he consumes (in gallons).

a) If the price of soup is $6 per pound, Billy should consume _____ pounds of cereal.

b) If he does this, his total consumer surplus will be _____.

c) Billy's demand for soup as a function of price is $q_d = $ _____ − _____p

Continuous supply

5. Suppose that Erin is a producer of beer, with a total cost function $TC = 20Q + \frac{1}{6}Q^2$, and marginal cost function $MC = 20 + \frac{1}{3}Q$, where Q is her production of beer, in gallons.

a) If the price of beer is $40 per gallon, she should produce _____ gallons, to maximize profit.

b) Her supply function is $Q_S = $ _____ + _____P, where P is the price of beer per gallon.

**c)** If the price of beer is $40 per gallon, how much producer surplus can she get? _____

6. Larry makes money by growing purple fungus. His total cost of growing fungus is given by the function $TC = 2q + \frac{1}{4}q^2$, and his marginal cost is given by $MC = 2 + \frac{1}{2}q$, where q is the quantity of fungus he grows, in bucketfuls.

a) Larry's supply function is $q_s = $ _____ + _____ p

For the rest of the problem, suppose that the price of fungus is $p = 5$.

b) At this price, Larry's optimal quantity is $q^* = $ _____, and his resulting producer surplus is $PS = $ _____.

c) On the blank graph to the right, draw Larry's supply curve, and a line representing the price. Shade in the area that represents Larry's producer surplus given his optimal quantity.
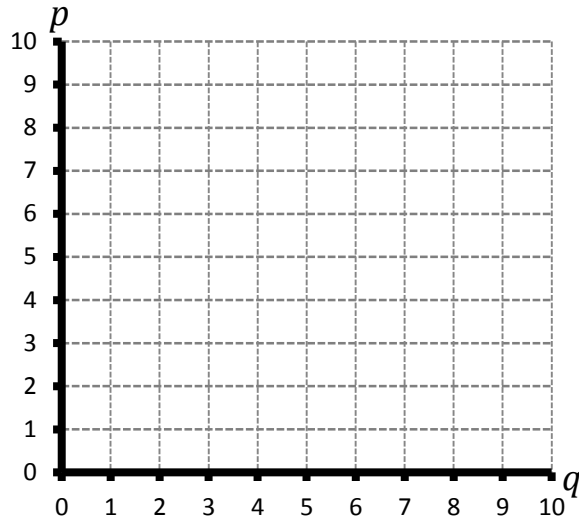
d) Explain clearly why the value of q^* you found maximizes producer surplus. Why would either a lower quantity $q < q^*$ or a higher quantity $q > q^*$ clearly lead to less producer surplus?

Opportunity cost

7. Suppose that Judy has a country house, and she is deciding how many weekends to spend there this summer. The bottom row in the table below gives the total benefit (in dollar amounts, and not taking cost into account) that she will get from going to the house for different numbers of weekends. For every summer weekend that she doesn't go to the house, she can get $200 of income by renting it to someone else. If travel to and from the house costs $100 per weekend, how many weekends should she spend there? _____

weekends	1	2	3	4	5	6
total benefit	$550	$1000	$1350	$1600	$1750	$1800

8. Same problem with different numbers. Rental income for one weekend is $500; travel cost is $100.

weekends	1	2	3	4	5	6
total benefit	$700	$1200	$1600	$1900	$2100	$2150

a) How many weekends should she spend there? _____

9. Define opportunity cost. How can it be different from the amount you have to pay to get something?

10. Building a park in an empty lot owned by the city will cost $10,000 in construction, landscaping, etc. There are 300 people who would benefit from the park, and each of them would be willing to pay a maximum of $100 to have it. A private developer is willing to pay $X to the city to acquire the same land, if the park isn't built. Assuming that public money will be spent on worthwhile things, ignoring distributional issues, etc., then the park should be built at long as X is less than _____.
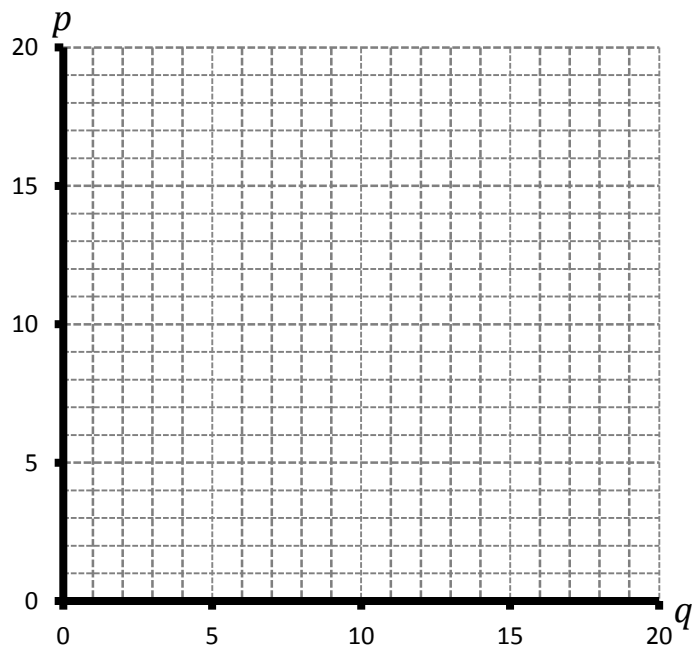
Equilibrium

11. The market for blue fuzz is characterized by the marginal benefit function $MB = 20 - q$, and the marginal cost function $MC = 2 + 2q$, where q is the quantity of blue fuzz produced and consumed.

a) Assuming that the market is competitive, etc., the equilibrium quantity of blue fuzz is _____, and the equilibrium price is _____.

b) In the equilibrium, consumer surplus is _____, and producer surplus is _____.

c) The market demand curve can be represented by the equation $q_d =$_____, and the market supply curve can be represented by the equation $q_s =$_____.

d) On the graph to the right, draw the demand curve and the supply curve. Shade the areas that represent consumer surplus and producer surplus.

12. The market for purple goo is characterized by the marginal benefit function $MB = 100 - \frac{1}{5}q$, and the marginal cost function $MC = 10 + \frac{1}{10}q$, where q is the quantity of purple goo produced and consumed.

a) Assuming that the market is competitive, etc., the equilibrium quantity of purple goo is _____, and the equilibrium price is _____.

b) In the equilibrium, consumer surplus is _____, and producer surplus is _____.

c) The market demand curve can be represented by the equation $q_d =$_____, and the market supply curve can be represented by the equation $q_s =$_____.

d) On the graph to the right, draw the demand curve and the supply curve. Shade the areas that represent consumer surplus and producer surplus.
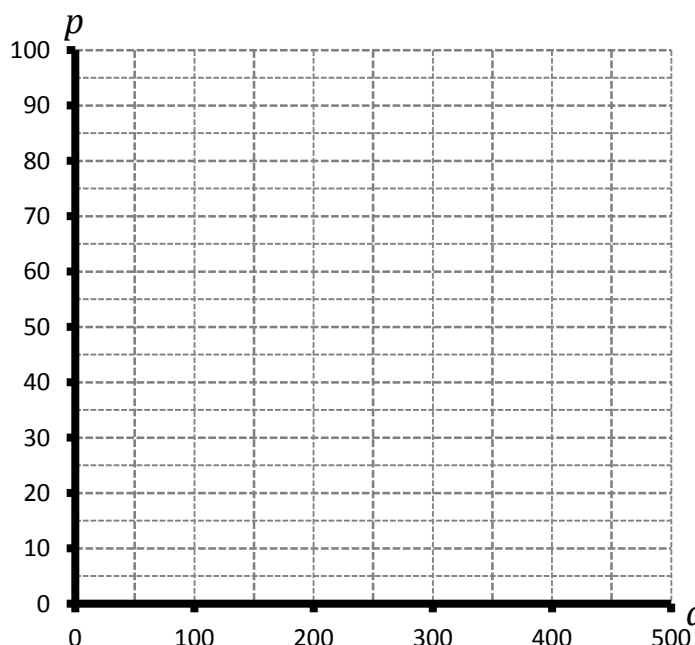
Shifts in supply and demand

13. Suppose that the market for wine behaves like a typical, perfectly competitive, 'textbook' supply and demand model, with smoothly increasing marginal cost and decreasing marginal benefit. Fill in each of the blanks below with "up" or "down".

a) If the supply curve shifts to the right, equilibrium price of wine will go _____, and equilibrium quantity will go _____.

b) If grapes (an input in wine production) become more expensive, we would expect the equilibrium price of wine to go _____ and the equilibrium quantity of wine to go _____.

c) Suppose that wine and beer are substitutes. If the price of beer decreases, we would expect the equilibrium price of wine to go _____ and the equilibrium quantity of wine to go _____.

14. Same problem, but with peanut butter instead of wine.

a) If a new invention reduces the cost of producing peanuts, we would expect the equilibrium price of peanut butter to go _____ and the equilibrium quantity of peanut butter to go _____.

b) Suppose that peanut butter and jelly are complements. If the price of jelly decreases, we would expect the equilibrium price of peanut butter to go _____ and the equilibrium quantity of peanut butter to go _____.