Economics 101
Fall 2013
Answers to Homework #2
Due Tuesday, October 1, 2013

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. Late homework will not be accepted so make plans ahead of time. Please show your work. Good luck!

Please realize that you are essentially creating "your brand" when you submit this homework. Do you want your homework to convey that you are competent, careful, and professional? Or, do you want to convey the image that you are careless, sloppy, and less than professional. For the rest of your life you will be creating your brand: please think about what you are saying about yourself when you do any work for someone else!

Question 1:

An international spy agency has three agents at their disposal to send on missions: Ethan Hunt, James Bond, and Jason Bourne. These spies can split their time by either apprehending evildoers or rescuing innocent people. The following table shows the maximum number of evildoers each spy can catch and the maximum number of innocent people he can save in a month:

	Hunt	Bond	Bourne
Number of evildoers caught	8	5	4
Number of innocent people saved	6	2	4

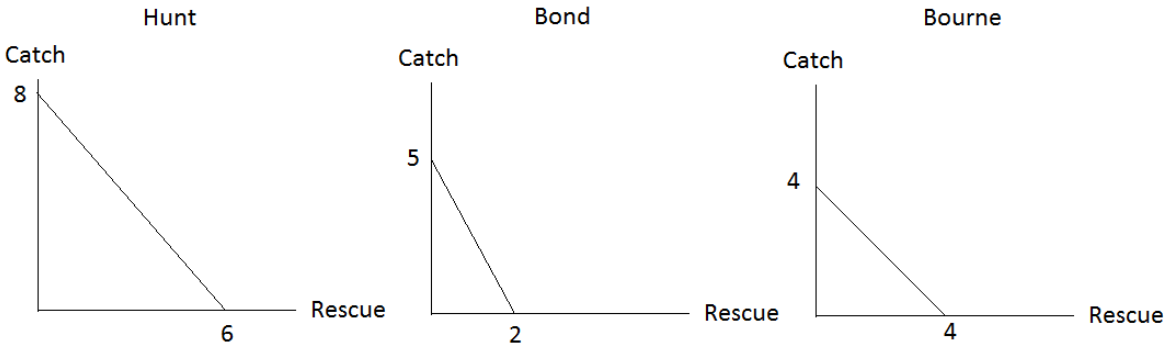
a) What are the opportunity costs of apprehending evildoers for each spy? What are the opportunity costs of rescuing innocent people for each spy?

	OC of catching an evildoer	OC of rescuing an innocent person
Hunt	¾ of a rescued innocent	4/3 of an captured evildoer
Bond	2/5 of a rescued innocent	5/2 of an captured evildoer
Bourne	1 of a rescued innocent	1 of an captured evildoer

b) Who has the absolute advantage in catching evildoers/rescuing innocents?

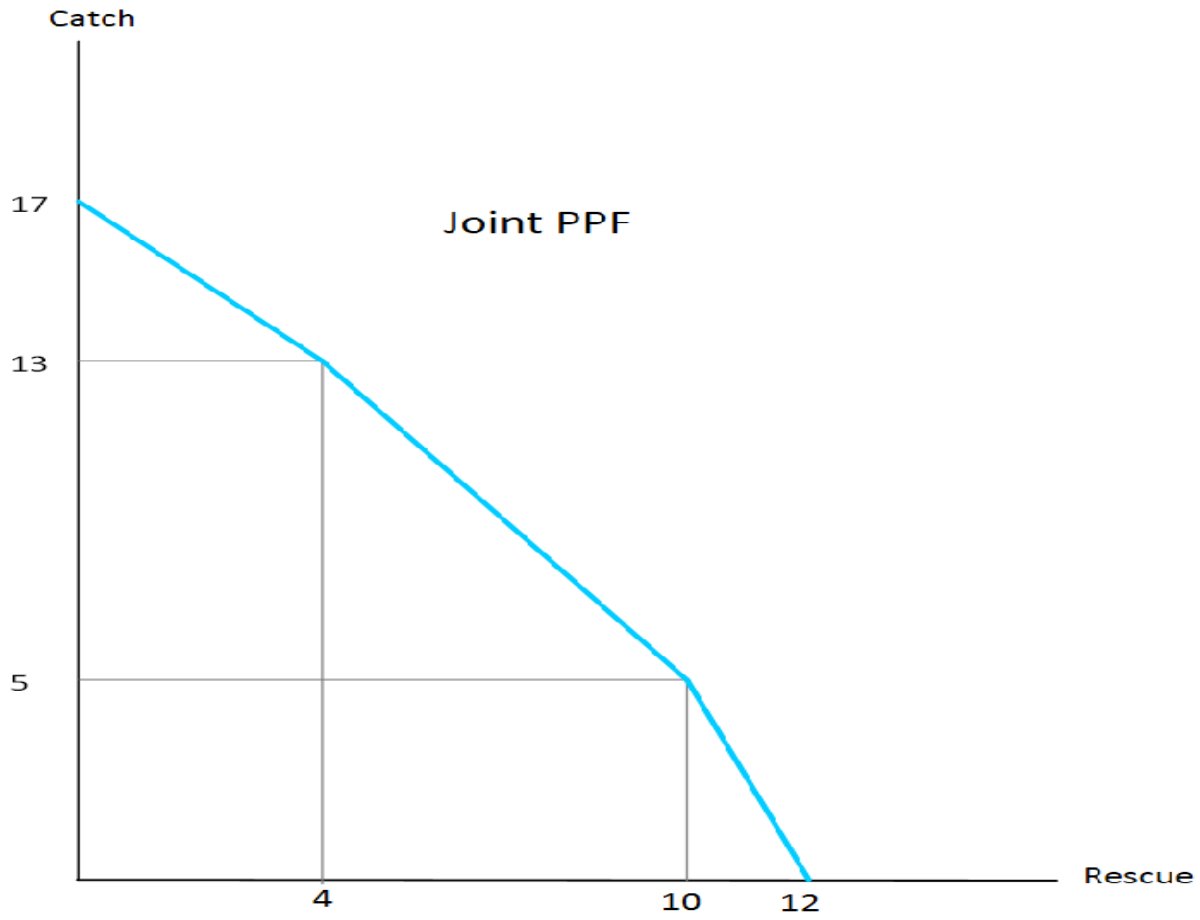
Ethan Hunt has the absolute advantage both in catching evildoers and rescuing innocents.

c) Draw on separate graphs the production possibility frontiers for each agent, putting the number of innocents rescued on the x axis and number of evildoers caught on the y axis. Label your graphs clearly and completely.



d) Now construct the joint PPF of the three agents. Clearly mark and give the locations of the kink points. Write down the equation for each segment of the joint PPF.

To draw a joint PPF, one needs to know the maximum amount of villains caught and maximum amount of innocent people saved if all spies work together. The maximum amount of villains caught is 17. The maximum amount of innocent people saved is 12.
Now, the intuition - start off at the position of 17 villains caught and 0 people saved. If the international agency wishes to save the first person, they must ask who has the least opportunity cost of forgoing catching villians to save innocents. Clearly Jason Bourne has the least opportunity cost of rescuing an innocent individual since he needs to forgo only 1 caught villain, so he should be the first person to rescue an innocent person. You have the first portion of the joint PPF. Bourne can continue to save up to 4 individuals, at this point, the international agency has 4 saved individuals and 13 caught villains. However, if the agency wants to save the 5th person, Bourne cannot rescue anymore individuals since he has exhausted all his capacity; thus, the next person in line to save innocent people must be Ethan Hunt since he has the second lowest opportunity cost of saving people. He can save at most 6 individuals. At this point, combined with Jason's saved people and caught villains, the international agency saved 10 people and caught 5 villains. The analysis for the rest repeats the same intuition until the economy arrives at 12 rescued individuals. The joint PPF is shown below:



The equation of joint PPF for each portion is simply equations of lines. Hence, the equation of joint PPF is:

$C = 17 - R$ if $0 \leq R \leq 4$

$C = \frac{55}{3} - \frac{4}{3}R$ if $4 \leq R \leq 10$

$C = 30 - \frac{5}{2}R$ if $10 \leq R \leq 12$

Question 2:

Use the demand and supply framework to qualitatively analyze the market in each case below

a) Fashion icon Blair Waldorf recently unveiled a new design of high heel shoes at a fashion show. Assuming that the supply of high heels stays the same (older designs are taken off the market to make room for the new ones), how will demand for high heels change? What will be the effect on equilibrium price and quantity? In your answer assume that consumers are eager to be seen wearing a "Blair Waldorf" creation.

Demand for high heels will shift rightward. Both equilibrium price and quantity will increase in the market for high heels.

b) To go up from the Burj Khalifa's 120th floor to 123rd floor in Mission Impossible 4 Ethan Hunt needs gloves that stick to any surface. During the mission, he realizes that gloves do not work properly if used constantly for a long period of time. How will Hunt's demand for grappling hook guns change at the end of the mission after he has been using his gloves? That is, will Hunt's demand for grappling hook guns shift right, left, or remain unchanged given the above information? Assume that grappling hook guns and gloves are substitutes, and grappling hook guns can be used for a long period of time. What are the effects on equilibrium price and quantity (increase/decrease/no change/ambiguous) in the market for grappling hook guns?

The demand for grappling hook guns will shift rightward. Holding everything else constant, both the equilibrium price and quantity of grappling hook guns will increase as a result of Hunt's substituting away from gloves and towards grappling hook guns.

c) Suppose the two legal comedy-dramas "Drop Dead Diva" and "The Good Wife" are substitutes for one another. Suppose CBS, a station that we will assume all TVs get without cable subscription, premiered the series "The Good Wife". Holding everything else constant, what was the impact on the demand for the DVD version of "Drop Dead Diva"?

Demand for DVD's of "Drop Dead Diva" shifted leftward

d) If the government announces during the month of December that a tax increase of 2 percent per coat is to take place in January, what would you expect to happen in December to the demand for coats? What are the effects on equilibrium price and quantity in December?

The demand for coats will increase: that is, the demand curve for coats will shift to the right. Both the equilibrium price of coats and equilibrium quantity of coats sold will increase in December in anticipation of the tax increase.

e) If bread is an inferior good, then what are the effects on equilibrium price and quantity of bread as consumer incomes increase?

Both the equilibrium price of bread and the equilibrium quantity of bread will decrease because the demand curve for bread will shift to the left if bread is an inferior good and incomes have increased.

f) Assume that the markets for sugar cane, rum, and whiskey are initially in equilibrium. Assume further that Hurricane Marilyn destroys much of the Jamaican sugar cane crop. Sugar cane is a principal ingredient in rum, but it is not an ingredient in whiskey. Assuming that rum and whiskey are substitutes for consumers, how will supply and demand of rum and whiskey shift as a result of this hurricane damage to the sugar cane crop? What are the effects on equilibrium price and quantity in each of the markets in this question?

The hurricane damage to the sugar cane crop will cause the supply of sugar cane curve to shift to the left. Holding everything else constant in the sugar cane market, the equilibrium price of sugar cane will increase and the equilibrium quantity of sugar cane will decrease.

In the market for rum, the increased price of sugar cane will cause the supply curve of rum to shift leftward as the price of an input to rum (the sugar cane) increases. The equilibrium price of rum will increase and the equilibrium quantity of rum will decrease.

In the market for whiskey, the rise in the price of rum (a substitute good) will cause the demand curve for whiskey to shift to the right as consumers switch from consuming the relatively more expensive rum to the relatively less expensive whiskey. In the market for whiskey the equilibrium price of whiskey will increase and the equilibrium quantity of whiskey will increase.

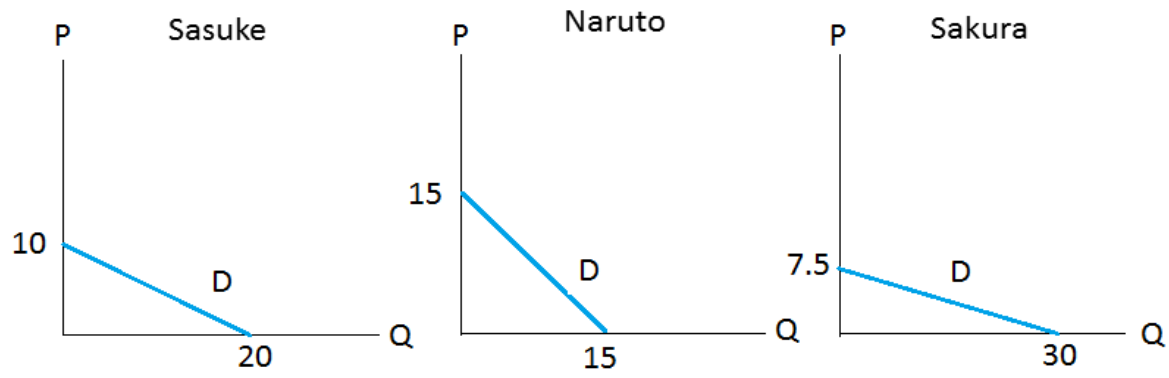
Question 3:

As beginner-level ninjas Naruto, Sasuke, and Sakura demand a traditional Japanese concealed weapon, the "shuriken." Their demand curves for shuriken are given by $Q^{Naruto} = 15 - P$

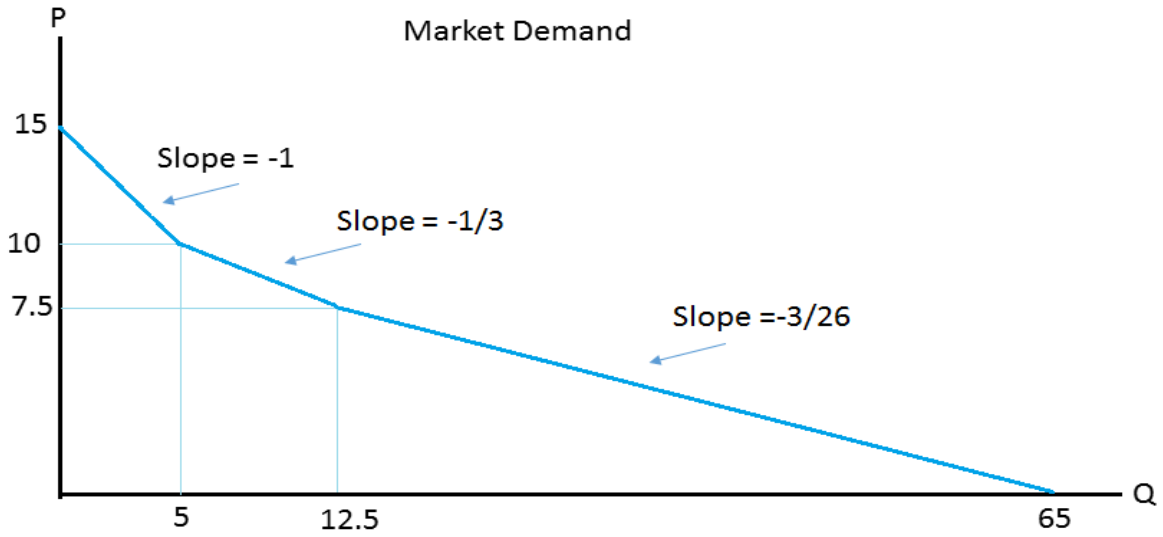
$Q^{Sasuke} = 20 - 2P$

$Q^{Sakura} = 30 - 4P$

a) Draw in three separate, horizontally aligned graphs the three individual demand curves. Label each graph clearly and completely.



b) In a new graph draw the market demand curve. Label any kink points that are in your graph (Note: you may have more than one kink point). Give the equation of the market demand curve for each linear segment of the demand curve expressed with P as the dependent variable (that is, write each segment of the demand curve in slope intercept form). Label your graph clearly and completely: in the graph identify the slope of each linear segment of the market demand curve, the coordinates of any kink point, and the y-axis and x-axis intercepts.



$P = 15 - Q$ if $0 \leq Q \leq 5$

$P = -\frac{1}{3}Q + \frac{35}{3}$ if $5 \leq Q \leq 12.5$

$P = -\frac{3}{26}Q + \frac{195}{26}$ if $12.5 \leq Q \leq 65$

Question 4:

Consider the market for widgets in which the initial demand curve is given by the equation $Q_1^D = 1050 - 2P$ and the initial supply curve is given by the equation $Q_1^S = P - 300$. Q refers to the number of widgets and P refers to the price per widget in dollars.

(a) What is the initial equilibrium price and quantity in this market?

In equilibrium $Q_1^D = Q_1^S$ so:

1050 – 2P = P - 300

3P = 1350

P = 450

Q = P-300 = 150

So the equilibrium price is $450 per widget and the equilibrium quantity is 150 widgets.

(b) Now suppose the demand curve shifts to the right and now is expressed by the equation $Q_2^D = 1200 - 2P$. Find the equilibrium price and quantity in the following cases:

(i) The supply curve remains the same, i.e. $Q_1^S = P - 300$

(ii) The supply curve shifts to the right and is now expressed by the equation $Q_2^S = P - 240$

(iii) The supply curve shifts to the right and is now expressed by the equation $Q_2^S = P$

Case (i): 3P=1500, so P=500, Q = 500-300 = 200

Case (ii): 3P=1440, so P = 460, Q = 460 – 240 = 220

Case (iii): 3P = 1200, so P = 400, Q = P = 400

(c) What do you observe about the equilibrium quantity in each case compared to the initial equilibrium in (a)? What about the equilibrium price?

In every case the quantity increased. However, in cases (i) and (ii) the price increased, whereas in the last case the price fell.

(d) Note: this question is a bit more challenging, but we are confident that you can do it! Given the increase in demand, how much would supply have to increase for the equilibrium price to return to the price found in (a)? (Hint: there are many ways to think about this question. One way is to think about the new supply curve as $Q^S = P - 300 + c$, at what value of c is the equilibrium price the same as in (a)? There are other ways to think about this question. For example, Professor Kelly thought about it using a

graph to guide her work.) Assume that the new supply curve is parallel to the initial supply curve: that is, the two supply curves have the same slopes.

Harder question!

In equilibrium $Q^S = Q_2^d$, so 1200-2(P-300+c) = P + c

1200 + 600 – 2P -2c = P + c

1800 = 3P + 3c

600 = P + c

P = 600 - c

Therefore for P = 450 we must have c = 150

Question 5

Consider the market for paper on the Battlestar Galactica. Demand is given by P = 10 – (1/5)Q. (For reference, paper is in thousands of sheets and price is in cubits, the currency used on the Battlestar Galactica). Supply is given by P = (1/5)Q

(a) What is the equilibrium price of paper and the equilibrium quantity of paper?

In equilibrium supply equals demand, so 10 – (1/5)Q = (1/5)Q

10 = (2/5)Q

Q = 50/2 = 25 thousand sheets of paper

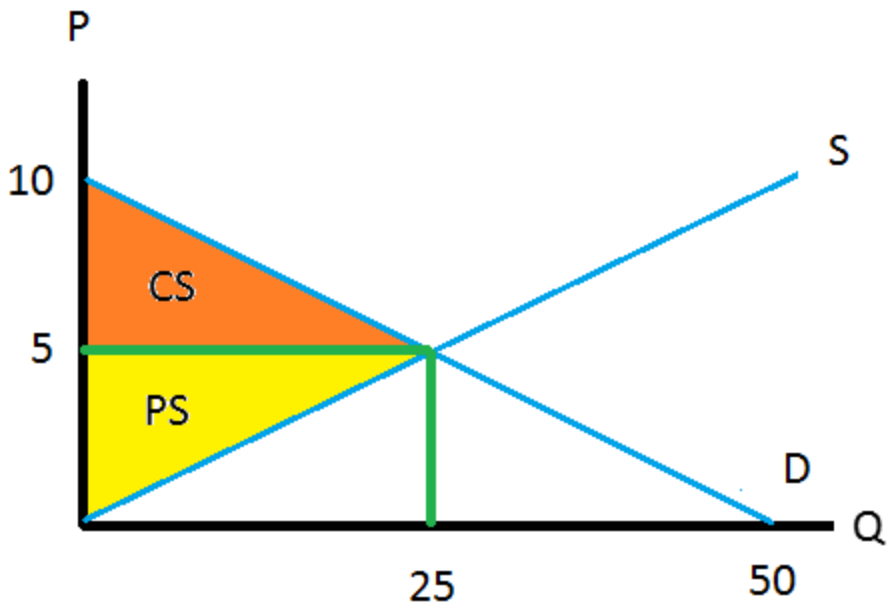
P = 25/5 = 5 cubits

The equilibrium price is 5 (cubits), the equilibrium quantity is 25 (thousand pages).

(b) What is the producer and consumer surplus at the equilibrium found in (a)?

CS = (1/2)(10-5)(25) = 125/2 = 62.5 cubits

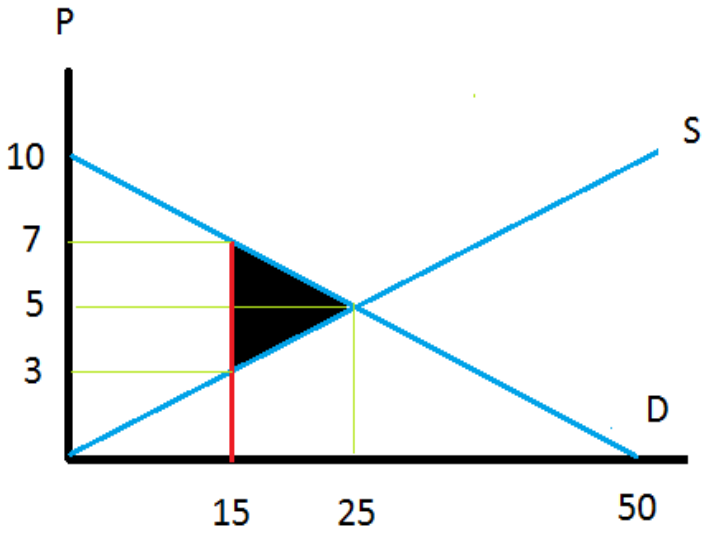
Identical calculation gives PS = 62.5 cubits



(c) Suppose Admiral Adama wants to conserve resources and mandates that people need a permit to produce paper. He sets a maximum output quota of 15 thousand pages. Is this quota binding? If so, what is the deadweight loss caused by the policy?

The quota is binding since equilibrium quantity in the market for paper is higher than 15. In order to compute the deadweight loss we need the prices on the supply and demand curves at this quantity control of 15. By substituting Q=15 into these curves you can find that P=3 on the supply curve and P = 7 on the demand curve. Hence deadweight loss is

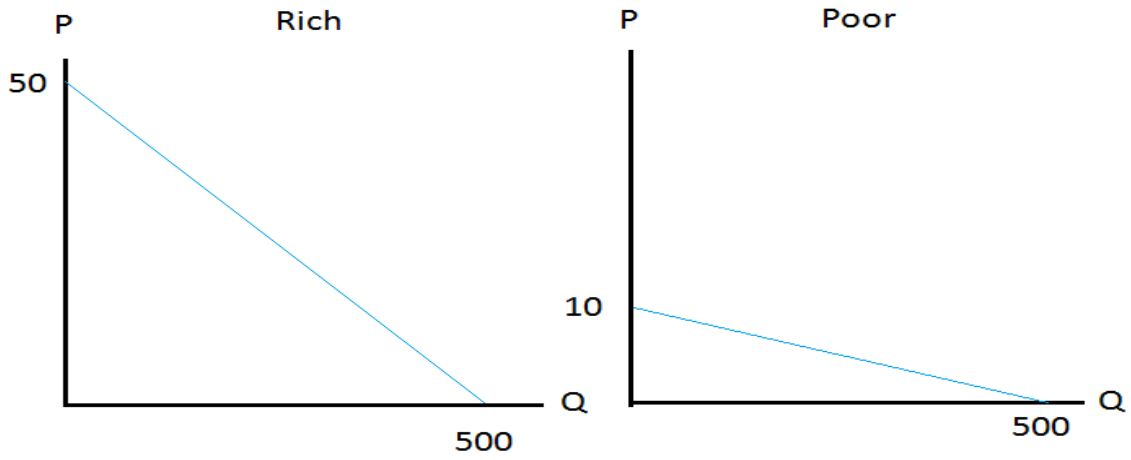
(1/2)(7-3)(25-15) = (1/2)(4)(10) = 20 cubits



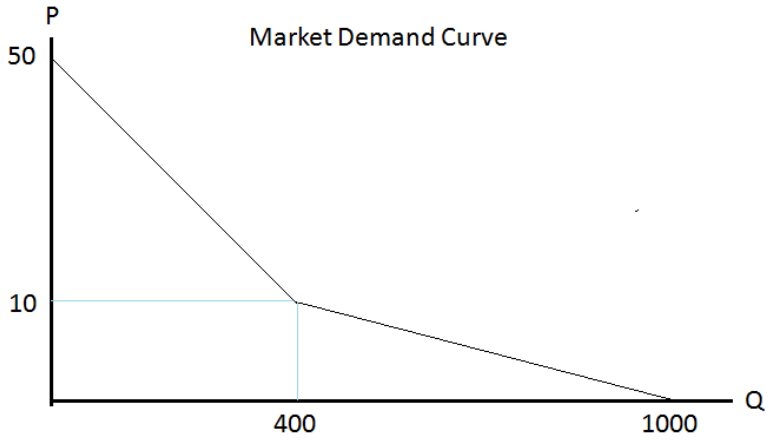
Question 6

Consider the market for freshly hunted boars in Westeros. The rich people in Westeros collectively have demand for boars expressed by the equation Q = 500 – 10 P where Q is the quantity of boars and P is the price per boar. (The price is in gold coins, though this is not relevant to the problem). The poor of Westeros also like boars, but have very little money, so their demand for boars is expressed by the equation Q = 500 – 50 P

a) Draw the demand curves of the rich and poor in Westeros on separate graphs. As ever, label your intercepts, remembering that the "y" intercept represents the price at which zero quantity is demanded.



b) Draw the market demand curve for boars in Westeros. Clearly label the kink point. Give the equation of the market demand curve for each linear segment of the demand curve. Express the demand curve with quantity as the dependent variable, i.e. with Q on the left hand side.



The equation of the demand curve for P greater than 10 is Q = 500 – 10P. At P = 10 the poor begin to demand boars as well, so demand is Q = 1000 – 60P.

c) Suppose the supply curve for boars is given by the equation Q = 20P - 400. What is the equilibrium price and quantity of boars given this supply curve and the market demand curve you found in (b)?

To answer this question it is best to first graph the supply function. Transforming it into "y-intercept" form we have:

(1/20) Q = P – 20

P = 20 + (1/20) Q

Then supply for prices less than 20 is 0 (see diagram below). Hence only the rich buy boars in equilibrium, so:

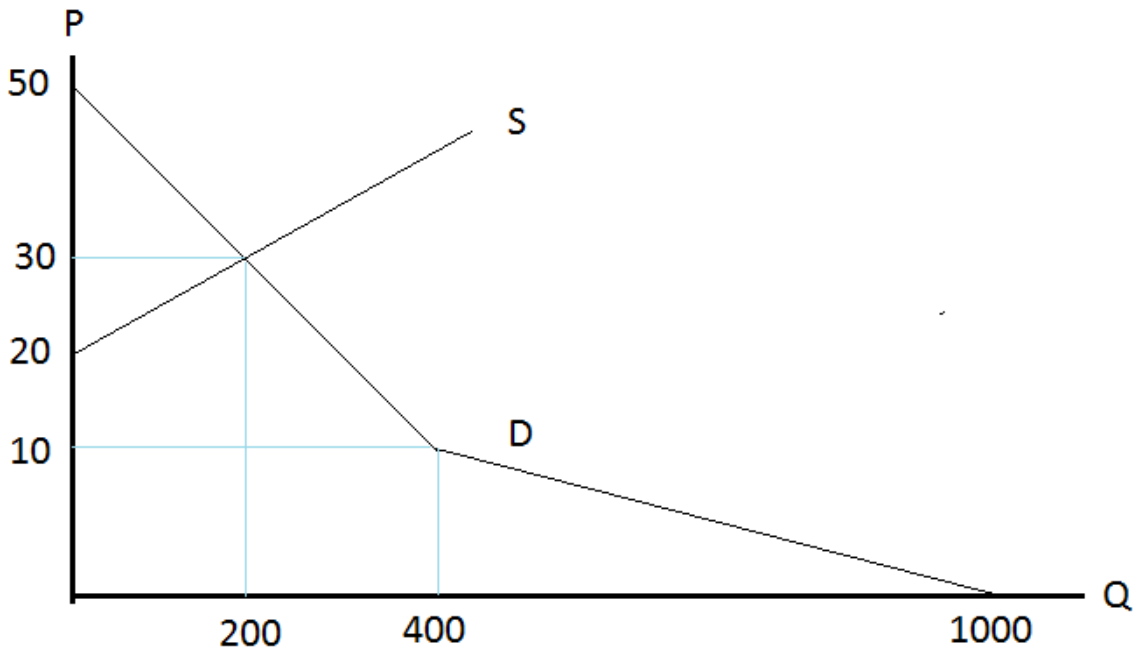
20P – 400 = 500 – 10P

30P = 900

P = 30

Q = 500 – 300 = 200

Hence the equilibrium price is 30 and equilibrium quantity is 200 boars.



d) Given the equilibrium you found in part (c), calculate the value of producer surplus and consumer surplus. Show your work for both calculations.

Producer surplus is (1/2)(200-0)(30-20) = 1000 gold coins.

Consumer surplus is (1/2)(200-0)(50-30) = 2000 gold coins

e) How much of the consumer surplus goes to the poor when the boar market is in equilibrium?

Only the rich buy boars in equilibrium, so the poor gain no surplus.

f) Westeros is ruled by King Joffrey, who is displeased by how much he has to pay for freshly hunted boar. He wants the price to be lower, so he passes a law mandating that the price must be no more than 15 gold coins. What is the new equilibrium quantity?

At a price of 15 the quantity supplied is 0.

g) What is the deadweight loss caused by Joffrey's policy?

Previously total surplus was valued at1000 + 2000 = 3000 gold coins. Now there is no trade at all so there is no surplus. Therefore the gains from trade that have been forgone (i.e. the deadweight loss) amount to a value equal to 3000 gold coins.