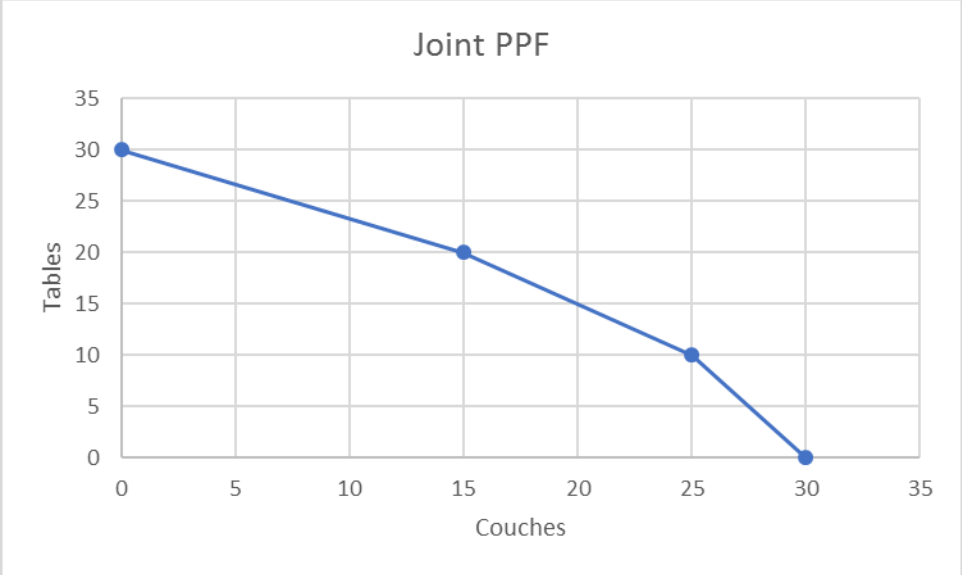
Economics 102
Fall 2017
Answers to Homework #2
Due 10/10/17

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.** Good luck!

Please remember to

- Staple your homework before submitting it.
- Do work that is at a professional level: you are creating your "brand" when you submit this homework!
- Do not submit messy, illegible, sloppy work.
- Show your work to get full credit.

1. You are given the following joint PPF for 3 individuals: Sarah, John, and Michael.



a. Write the equation for each line segment in the joint PPF, including the ranges of tables that each line segment covers.

b. Suppose that Sarah has the lowest opportunity cost of producing couches, and Michael has the highest opportunity cost of producing couches. Draw the 3 individual PPFs for Sarah, John, and Michael.

c. Who has the absolute advantage in producing couches?

d. Who has the comparative advantage in producing couches?

e. Will Sarah be willing to trade 1 couch to John for ½ table? Why or why not?

SOLUTION:

a. For each line segment, use the two endpoints to find the slope, then use this slope along with one of the points to find the T-intercept.

For the left-most line segment, the slope is (30 - 20)/(0 - 15) = -2/3, and we can see from the graph that the T-intercept is 30. This gives $T = 30 – (2/3)C$ when $T \geq 20$.

For the middle line segment, slope = (20 - 10)/(15 - 25) = -1. Plugging in to find the intercept,

$20 = -15 + b$

$35 = b$

So, we get $T = 35 – C$ when $20 \leq T \leq 10$

For the right line segment, slope = (10 – 0)/(25 - 30) = -2. Plugging in to find the intercept,

$0 = -2(30) + b$

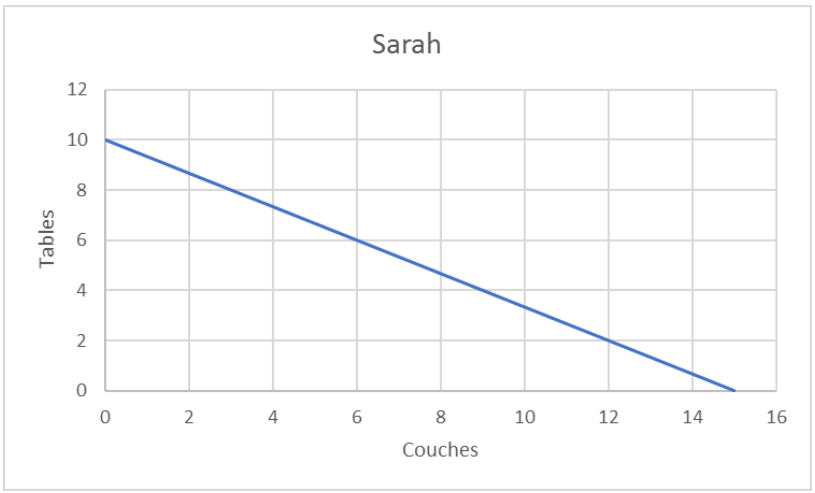
$60 = b$

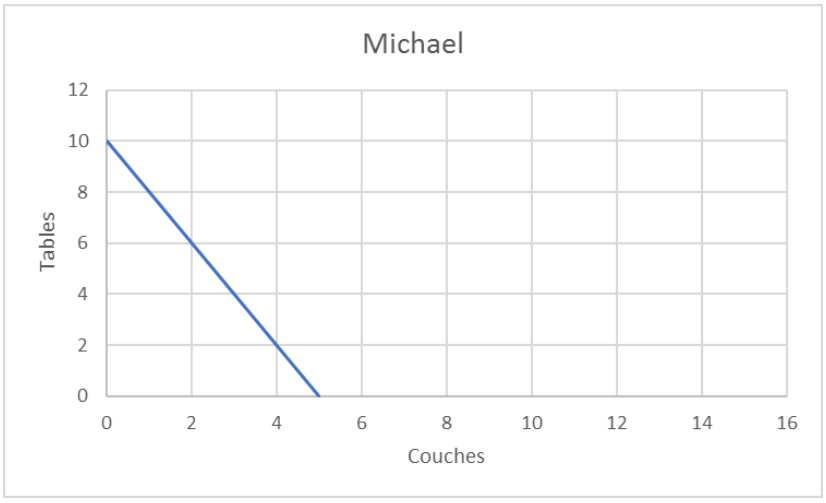
So, $T = 60 – 2C$ when $T \leq 10$.

b. If Sarah has the lowest opportunity cost of producing couches, if we start at the point where everyone is producing only tables, Sarah should be the first to switch to producing couches. So, her PPF must come from the left segment of the joint PPF. We can see from the joint ppf that on her own she could produce 15 – 0 = 15 couches, or 30 – 20 tables.

Since Michael has the highest opportunity cost of producing couches, he should be the last to switch from producing tables to couches, so his PPF will come from the right segment. On his own, he could produce 30 – 25 = 5 couches, or 10 – 0 = 10 tables.

Only John is left, so his PPF must come from the middle segment. He can produce 25 – 15 couches = 10 couches, or 20 – 10 = 10 tables.





c. Sarah, because she can produce 15 couches while John can only produce 10 couches and Michael can only produce 5 couches.

d. Sarah, because she has to give up the least amount of tables to produce 1 couch.

e. No, because Sarah's opportunity cost of producing 1 couch is 2/3 table, so she will not be willing to accept ½ table for 1 couch, since she could get more tables by producing them herself.

2. Suppose there is a market where Lois, Steven, and Yunhan are the only consumers, and the only product being sold is bananas. Lois wants to buy 3 bunches of bananas when the price is $1.00/bunch, but only wants to buy 1 bunch when the price is $2.00/bunch. Steven wants to buy 5 bunches when the price is $1.00/bunch, and 2 bunches when the price is $2.00/bunch. Yunhan wants to buy 8 bunches when the price is $1.00/bunch, and 4 bunches when the price is $2.00/bunch. Assume everyone has linear demand curves.

a. Write the equation for Lois's demand curve, in both P-intercept form and in Q-intercept form.

b. Write the equation for Steven's demand curve, in both P-intercept form and in Q-intercept form.

c. Write the equation for Yunhan's demand curve, in both P-intercept form and in Q-intercept form.

d. Find the equation of each line segment of the market demand curve and provide the ranges for each segment of the market demand curve.

e. Draw the market demand curve, and label any kinks in the graph.

SOLUTION:

a. We have the two points (3, 1) and (1, 2). So, the slope is (2 – 1) / (1 – 3) = -1/2. Plugging one of the original points in to find the P intercept,

$2 = (-1/2)(1) + b$

$(5/2) = b$

So, $P = (5/2) – (1/2)Q$ is Lois' demand curve in P-intercept form.

Solving for Q, we get

$P – (5/2) = -(1/2)Q$

$Q = 5 – 2P$ is Lois' demand curve in Q-intercept form.

b. Using (5, 1) and (2, 2), we find the slope (2 – 1) / (2 – 5) = -1/3. Plugging in,

$2 = (-1/3)(2) + b$

$(8/3) = b$

So, $P = (8/3) – (1/3)Q$ is Steven's demand curve in P-intercept form.

Solving for Q, we get

$P – (8/3) = -(1/3)Q$

$Q = 8 – 3P$ is Steven's demand curve in Q-intercept form.

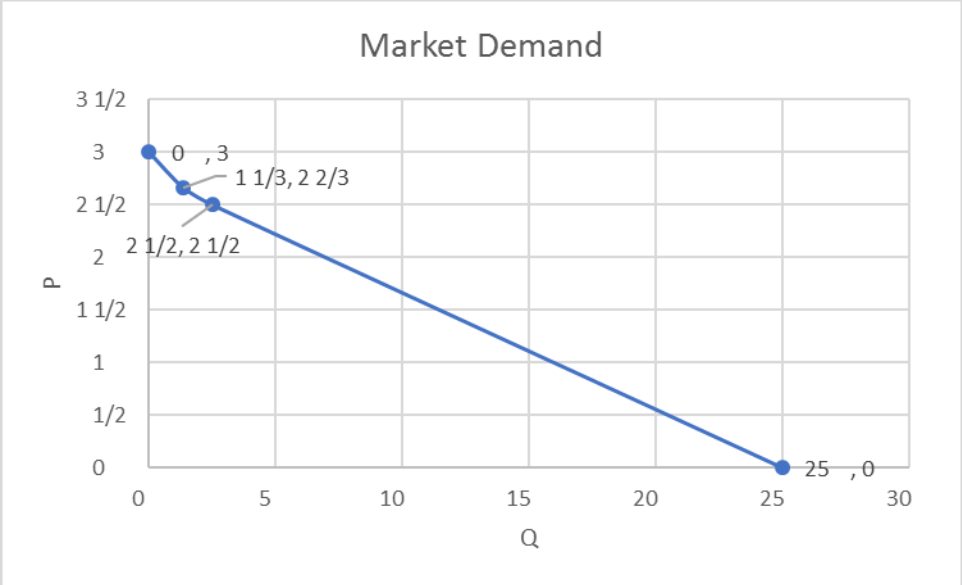
c. Using (8,1) and (4,2), we find the slope (2 – 1) / (4 – 8) = -1/4. Plugging in

2 = (-1/4)(4) + b
3 = b
So, P = 3 – (1/4)Q is Yunhan's demand curve in P-intercept form.

Solving for Q, we get
P – 3 = -(1/4)Q
Q = 12 – 4P is Yunhan's demand curve in Q-intercept form.

d. Looking at the intercepts of the equations in P-intercept form, we can see that no one will buy any bananas if the price is greater than 3. If the price is between 3 and (8/3), only Yunhan will want to buy bananas, so the demand curve is Q = 12 – 4P. If the price is between (8/3) and (5/2), Steven and Yunhan will want to buy bananas, and adding their demand curves gives Q = 20 – 7P. All three people will be in the market is the price is below (5/2), and the joint demand curve is Q = 25 – 9P.

e.



3. Suppose in the market for bananas, there are two suppliers: Bananas Unlimited and Best Bananas. Bananas Unlimited is willing to sell 3 bunches of bananas when the price is $1/bunch, and 10 bunches when the price is $2/bunch. Best Bananas is willing to sell 13 bunches when the price is $1/bunch and 26 bunches when the price is $2/bunch.

a. Find the equation for Bananas Unlimited's supply curve, in both P-intercept and Q-intercept form.

b. Find the equation for Best Bananas's supply curve, in both P-intercept and Q-intercept form.

c. Find the equation for each line segment of the market supply curve.

d. Draw the market supply curve, and label any kinks in the graph.

SOLUTION:

a. For Bananas Unlimited we have the two points (Q, P) = (3, 1) and (10, 2). So, the slope is (2 – 1) / (10 - 3) = (1/7). Plugging one of the original points in to find the P intercept,

$1 = (1/7)(3) + b$

$(4/7) = b$

So, $P = (1/7)Q + (4/7)$

Solving for Q,

$P – (4/7) = (1/7)Q$

$Q = 7P - 4$

b. For Best Bananas use the two points (Q, P) = (13, 1) and (26, 2), we find the slope is (2 – 1) / (26 - 13) = (1/13). Plugging one of the original points in to find the P intercept,

$1 = (1/13)(13) + b$

$0 = b$

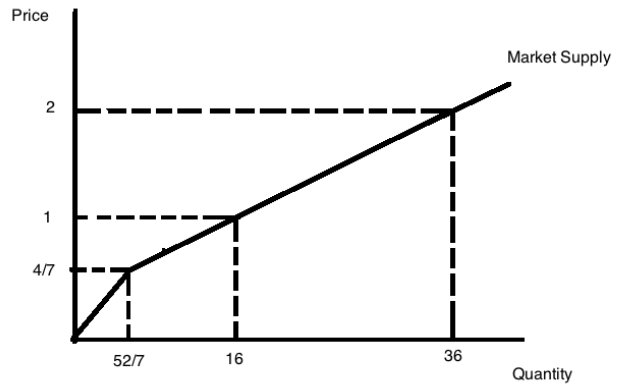
So, $P = (1/13)Q$

Solving for Q,

$Q = 13P$

c. Looking at the intercepts of the equations in P-intercept form, we see that as long as the price is between 0 and (4/7), only Best Bananas will be in the market. The market supply curve for this segment is Q = 13P. If the price is above (4/7), both firms will be in the market, and adding their supply curves gives Q = 20P – 4.

d.



4. Using the information provided in questions 2 and 3,

a. Find the equilibrium supply and demand in the market for bananas.

b. How many bunches bananas will Lois consume? How many with Steven consume? How many will Yunhan consume?

c. How many bunches of bananas will Bananas Unlimited supply? How many will Best Bananas supply?

d. What is the value of the producer surplus in this market? Warning: this is a complicated calculation and you may find it easier to keep all your work in fractions, particularly if you opt to not use a calculator. We, of course, did not use a calculator on this problem-so the answer key will use fractions.

e. Suppose that the area where Bananas Unlimited sources their bananas from experiences a natural disaster, and Bananas Unlimited is restricted to supplying less bananas than before at each price. Given this information and holding everything else constant, does the equilibrium quantity increase or decrease? Does the equilibrium price increase or decrease?

SOLUTION:

a. We can set the market demand equation ($Q = 25 - 9P$) and the market supply equation ($Q = 20P - 4$) equal to each other to find their intersection.

$20P - 4 = 25 - 9P$
$29P = 29$
$P = 29/29 = 1$

Plugging in to find Q,

$Q = 20(1) - 4 = 16$

So the equilibrium is (16, 1).

b. In this case, since we were given in the problem how many each individual would consume if the price was \$1/bunch, we can use that information directly. In general, we could plug $P = 1$ into each individual's demand curve. So, Lois will consume $Q = 5 - 2(1) = 3$ bunches. Steven will consume $Q = 8 - 3(1) = 5$ bunches. Yunhan will consume $Q = 12 - 4(1) = 8$ bunches.

c. Again, we can use the information from the question, but in general, you should plug in the price to the two firm's individual supply curves. So Bananas Unlimited will supply $Q = 7(1) - 4 = 3$ bunches, and Best Bananas will supply $Q = 13(1) = 13$ bunches.

d. Using the market supply curve, we can calculate producer surplus. This is a bit of a challenging calculation since in this case the producer surplus is equal to the sum of a triangle and a trapezoid. Alternatively you could think of the area of producer surplus as the sum of two triangles and a rectangle: let's use this method to do the calculation.
Producer surplus $= (1/2)(4/7 - 0)(52/7 - 0) + (1 - 4/7)(52/7 - 0) + (1/2)(1 - 4/7)(16 - 52/7)$. This is messy! I am not going to use a calculator: for the sheer challenge of it!
$PS = 104/49 + 156/49 + (1/2)(3/7)(112/7 - 52/7)$
$PS = 260/49 + (1/2)(3/7)(60/7)$
$PS = 260/49 + (3/7)(30/7)$
$PS = 260/49 + 90/7$

PS = 350/49 = $(50/7) which is just a bit more than $7

e. The supply curve for Bananas Unlimited will shift to the left and this will cause the market demand curve to also shift to the left. At every price the quantity supplied will be smaller than it was initially. The equilibrium point in the market for bananas will have a lower equilibrium quantity and a higher equilibrium price relative to the initial equilibrium.

5. Suppose in the closed economy of Cedarville, the market for clocks is described by the following equations:

Domestic Demand: P = 60 – 2Q
Domestic Supply: P = 10 + 2Q

a. What is the market equilibrium if this economy is closed to trade?

b. What are the consumer surplus and producer surplus when this economy is closed to trade? What is the total surplus when this economy is closed to trade?

c. Now, this economy is opened to trade, and the world price of clocks is $25. What happens to consumer, producer, and total surplus in Cedarville's clock market?

d. Now, suppose the government implements a tariff of $5/clock. What is the new consumer, producer, and total surplus in Cedarville's clock market? How much revenue will the tariff raise for the government of Cedarville? What is the deadweight loss due to the imposition of this tariff in Cedarville's market for clocks?

e. Explain how trade benefits some and hurts others, using numbers from this problem. Explain the economic effects of the tariff.

SOLUTION:

a. Set the market demand and market supply equal to each other,

60 – 2Q = 10 + 2 Q
50 = 4Q
12.5 = Q

Plugging in to find price,

P = 60 – 2(12.5) = $35

So the equilibrium is (Q, P) = (12.5, 35).

b. The consumer surplus is (1/2)*($60/unit-$35/unit)*12.5 = $156.25.
The producer surplus is (1/2)*($35/unit-$10/unit)*12.5 = $156.25.
The total surplus is the sum of consumer and producer surplus = $312.50.

c. If the world price is $25 per clock, domestic consumers will demand 17.5 clocks and domestic producers will supply 7.5 clocks. The excess demand of 10 clocks will be imported from the world market.

Consumer surplus is now (1/2)*($60/unit-$25/unit)*17.5 = $306.25.
Producer surplus is now (1/2)*($25/unit-$10/unit)*7.5 = $56.25.
The total surplus is $362.50.

d. The tariff increases the price of clocks to $30 per clock. At this price domestic consumers will demand 15 clocks and domestic producers will supply 10 clocks, and the excess demand of 5 clocks will be imported.
Consumer surplus is (1/2)*($60/unit-$30/unit)*15 = $225.
Producer surplus is (1/2)*($30/unit-$10/unit)*10 = $100.
The total surplus of consumers and producers = $325.
The revenue that the government will generate is $5/unit*5 clocks = $25.
The total surplus (including government revenue) is $350.
Deadweight loss due to the tariff = (1/2)(30 – 25)(10 – 7.5) + (1/2)(30 – 25)(17.5 – 15) = $12.50

e. In this problem, consumers were benefited from trade while domestic producers were hurt. Consumer surplus increased from $156.25 to $306.25 when trade was opened with no restrictions, but producer surplus fell from $156.25 to $56.25. Total surplus increased due to trade, so society benefited on the whole. When the tariff was imposed, consumers still benefitted from trade, but not as much as when there were no trade restrictions. Consumer surplus with the tariff was $225, an amount that was between the $156.25 when there was no trade and the $306.25 when trade was completely free. Similarly, domestic producers were still hurt with the imposition of the tariff, but they were hurt less than they were when there was open trade. Producer surplus with the tariff was $100, an amount between the $156.25 when there was no trade and $56.25 when trade was completely free.

6. Suppose the small, closed economy of Coldsville's market for winter coats is described by the following domestic demand and domestic supply equations:

Domestic Demand: Q = 200 – 2P
Domestic Supply: Q = (1/2)P

a. Find the market equilibrium when this market is closed to trade.

b. Find the consumer, producer, and total surplus when this market is closed to trade.

c. Now, this economy is opened to trade, and the world price of winter coats is $20. What happens to consumer, producer, and total surplus when this market opens to trade?

d. Suppose the government of Coldsville implements an import quota of 100 coats. How does the new consumer surplus compare to the consumer surplus when the economy was closed to trade? How does the new consumer surplus compare to the consumer surplus when the economy was open to unrestricted trade?

e. Suppose the government of Coldsville implements an import quota of 100 coats. How does the new producer surplus compare to the producer surplus when the economy was

closed to trade? How does the new producer surplus compare to the producer surplus when the economy was open to unrestricted trade?

f. What is the value of the license holder revenue when the government of Coldsville implements this import quota?

g. What is the value of the deadweight loss when the government of Coldsville implements this import quota?

SOLUTION:

a. Setting the equations equal to each other,

$200 - 2P = (1/2)P$

$200 = (5/2)P$

$P = \$80$

Plugging back in to find Q,

$Q = (1/2)(80) = 40$ coats

b. The consumer surplus is $(1/2)*(\$100/coat - \$80/coat)*40 = \$400$
The producer surplus is $(1/2)*(\$80/coat)*40 = \$1600$
The total surplus is $\$400 + \$1200 = \$2000$

c. Now, domestic consumers will demand $200 - 2(20) = 160$ coats and domestic producers will supply $(1/2)(20) = 10$ coats. The excess demand of 150 coats will be imported from the world market.
The new consumer surplus with trade is $(1/2)*(\$100/coat - \$20/coat)*160 = \$6400$
The new producer surplus is with trade $(1/2)*(\$20/coat - \$0/coat)*10 = \$100$
The new total surplus is $\$6400 + \$100 = \$6500$

d. When the import quota is set at 100 coats, this means that the difference between the quantity demanded domestically and the quantity supplied domestically is 100 coats. So, we can find the price by setting $Q^D = Q^S + 100$.

$200 - 2P = (1/2)P + 100$

$100 = (5/2)P$

$P = \$40$ per coat

To find the quantity demanded domestically at this price, plug this price back in to the domestic demand curve:

$Q = 200 - 2(40) = 120$ coats

The new consumer surplus is $(1/2)*(\$100/coat - \$40/coat)*120 = \$3600$. Consumer surplus with the import quota is greater than the consumer surplus when the market was closed to trade, but less than the consumer surplus when the market was open to trade without the import quota.

e. To find the quantity supplied domestically,

Q = (1/2)*40 = 20 coats

Note that we could have also found the quantity supplied domestically by subtracting the import quota from the quantity demanded.

The new producer surplus is (1/2)*($40/coat)*20 = $400. Producer surplus with the import quota is less than the producer surplus when the market was closed to trade, but greater than the producer surplus when the market was open to trade without the import quota.

f. The value of the license holder revenue when the government of Coldsville implements this import quota is equal to (40 – 20)(100) = $2000.

g. The deadweight loss due to the imposition of the import quota is equal to (1/2)(40 – 20)(20-10) + (1/2)(40 – 20)(160 – 120) = $100 + $400 = $500. Notice that the sum of the CS with the import quota + the PS with the import quota + the deadweight loss from the quota + the license holder revenue from the import quota is $6500. This is precisely the value of the total surplus when this market is open to trade: the import quota simply redistributes the total surplus so that domestic consumers lose, domestic producers win, license holders win and there is a general loss of surplus to the deadweight loss.