Economics 102
Summer 2017
Answers to Homework #2
Due June 6, 2017

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!

1. Analyze each of the following scenarios and provide a graph to illustrate your answer. Use (Qo, Po) to designate the initial equilibrium price and quantity, and (Q', P') to designate the new equilibrium price and quantity. Illustrate in your graph any shifts that occur in the demand and/or supply curves.

a. Consider the market for coffee mugs that is initially in equilibrium. Suppose that the price of coffee decreases. Analyze the impact of this change on the equilibrium price and quantity of coffee mugs. Use a graph to illustrate your answer.

b. Return to the coffee mug market that is initially in equilibrium. Suppose that the price of coffee decreases while at the same time, clay, an input in coffee mugs, has a price increase. Analyze the impact of this change on the equilibrium price and quantity of coffee mugs. Use a graph to illustrate your answer.

c. Consider the market for televisions that is initially in equilibrium. New technology makes it possible to view visual content not only on televisions, but also on smart phones, laptops, and a variety of other types of smart devices. Given these developments what do you predict is going to happen to the equilibrium price and quantity of televisions? Use a graph to illustrate your answer.
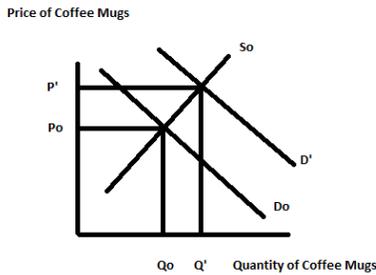
d. Consider the market for traditional cars: that is, gasoline-powered cars. Younger Americans are choosing to live in more urban locations; take advantage of car services like Uber, Lyfe, and Zipcar; and even, in some cases, choosing to not get a driver's license (and maybe not even bother to learn to drive). At the same time, Google and Uber are pioneering new technology that will replace gasoline-powered and human-driven cars with driverless, electric cars. Given these changes, what do you predict will happen to the equilibrium price and equilibrium quantity of gasoline-powered cars over the next two decades (think about this in a longer time frame than just what is happening in this twenty-four hour period of time)? Use a graph to illustrate your answer.

e. Consider the market for ice cream that is initially in equilibrium. Suppose that people's income increase and that you know that the income elasticity of demand

for ice cream is .5. From this information, analyze what happens to the equilibrium price and equilibrium quantity of ice cream. Illustrate your answer with a graph.
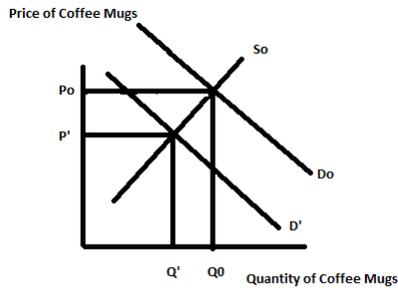
Answer:
a. Coffee and coffee mugs are complements. When the price of coffee decreases, the demand for coffee mugs will shift to the right. The equilibrium price of coffee mugs will increase and the equilibrium quantity of coffee mugs will increase. Here is a graph to illustrate this change.
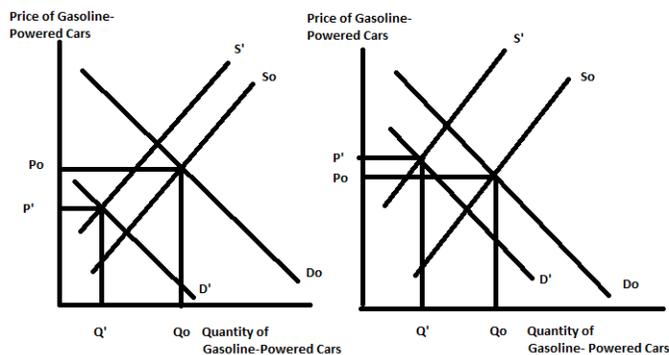

b. Coffee and coffee mugs are complements. When the price of coffee decreases, the demand for coffee mugs will shift to the right. But, we also have the price of clay, an input in the production of coffee mugs, increasing. This will cause the supply curve to shift to the left. We do not know the relative size of these two shifts: so we can predict that the equilibrium price of coffee mugs will increase, but the equilibrium quantity of coffee mugs may increase, decrease, or remain the same (quantity will be indeterminate). Here are two graphs to illustrate this idea.
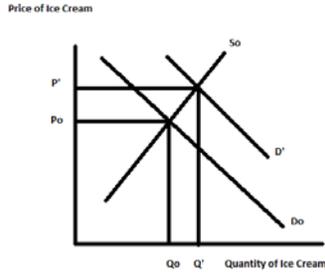

c. The ability to view television type content on a variety of devices will likely mean that tastes and preferences for televisions will decrease: this will shift the demand for television to the left. Equilibrium price and quantity in the television market should decrease given these changes. Here's the graph to illustrate this situation.

Price of Coffee Mugs — Quantity of Coffee Mugs

d. This is a more complicated scenario! It is easy to see that the demand for gasoline-powered cars will shift to the left due to changing tastes and preferences from this younger group of drivers. But, the supply curve will also likely shift to the left: driverless cars and gasoline-powered cars are substitutes in production. Driverless cars also represent a change in technology that will have a negative impact on gasoline-powered cars. So, I would model this as two shifts: a shift to the left of the demand curve and a shift to the left of the supply curve. This means that the equilibrium quantity will decrease and the equilibrium price may increase, decrease or remain the same (price will be indeterminate). Here are two graphs to illustrate these possibilities:

e. First, you need to recall that income elasticity of demand is the ratio of the percentage change in the quantity demanded of the good to the percentage change in income. You are told that this is a positive number and that income has increased: this implies that the percentage change in the quantity demanded must be a positive number. That is, as income rises the quantity of ice cream demanded is also increasing. This tells us that ice cream is a normal good: when income increases and the good is a normal good, then the demand curve for that good will shift to the right. From this we can conclude that the equilibrium price and equilibrium quantity of ice cream has risen relative to their initial levels. Here's the graph:

Price of Ice Cream

2. (Do not use a calculator on this problem: you are working to grow stronger computational skills and to do that I need you to stop turning to your calculator so quickly! Also, work this with the fractions (no decimals) but think about how you can "get rid of" the fractions. This is another aspect that I am working on with respect to growing your numerical literacy.) Suppose there are two firms in a market, Good Enterprises and Products Unlimited. You are told the following information about this market. Good Enterprises supplies 200 units of the product sold in this market when the price is $10 per unit. When the price in this market increases to $20, the quantity of the product supplied by Good Enterprises increases by 100 units. Good Enterprises supply curve is linear. Products Unlimited supplies 150 units of the product sold in this market when the price is $15 per unit. When the price increases to $30, the quantity of the product supplied by Products Unlimited increases to 300 units. Products Unlimited's supply curve is also linear.

a. From the above information write the equation for the supply curve for Good Enterprises.

b. From the above information write the equation for the supply curve for Products Unlimited.

c. Assuming that these two firms are the only producers of this product, draw a graph that illustrates the market supply curve for this product. Then, provide an algebraic expression for the market supply curve. If you need more than one equation please be sure to note what the relevant range of prices is for each equation.

Now, suppose that Products Unlimited discovers a new technology (that they patent and therefore do not share with any of their competitors) that allows them to double their output at every price level. [Hint: you might find it helpful to draw a graph of Products Unlimited's initial supply curve and then from this graph draw their new supply curve.]

d. Given this new information write the equation for Products Unlimited's new supply curve.

e. Given this new information, provide an algebraic expression for the market supply curve. If you need more than one equation please be sure to note what the relevant range of prices is for each equation.

Answers:
a. Good Enterprises' supply curve contains the two points (Q, P) = (200, $10) and (300, $20). From these two points we can calculate the slope of the supply curve as: slope = (change in price)/(change in quantity) = (10 - 20)/(200 - 300) = 1/10. We can then plug this slope and one of our known points into the general slope intercept form equation to find the y-intercept:
y = mx + b
P = (1/10)Q + b
10 = (1/10)(200) + b
-10 = b
The equation for the supply curve for Good Enterprises is: P = (1/10)Q - 10.

b. Products Unlimited's supply curve contains the two points (Q, P) = (150, $15) and (300, $30). From these two points we can calculate the slope of the supply curve as: slope = (change in price)/(change in quantity) = (15 - 30)/(150 - 300) = 1/10. We can then plug this slope and one of our known points into the general slope intercept form equation to find the y-intercept:
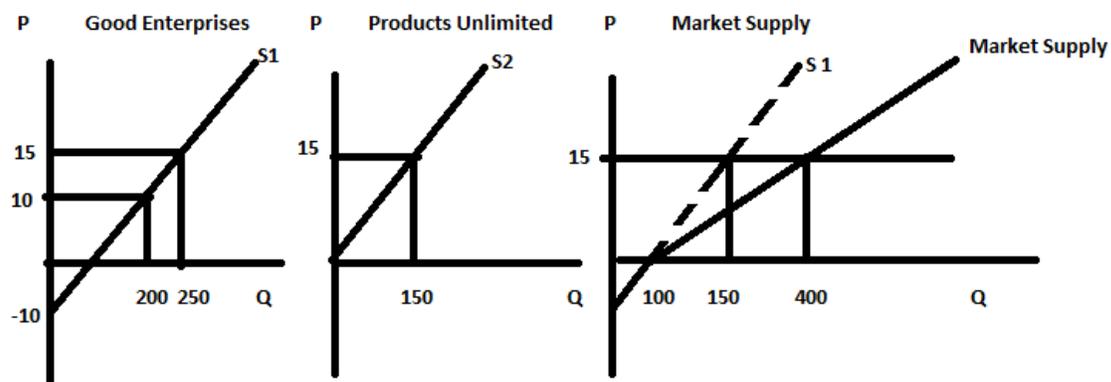y = mx + b
P = (1/10)Q + b
15 = (1/10)(150) + b
0 = b
The equation for the supply curve for Products Unlimited is: P = (1/10)Q.

c. Let's start with a sketch:

To find the market supply curve you need to horizontally sum the individual supply curves in the market. A simple sketch will guide you in this process. If you draw a graph of the supply curve for Good Enterprises (P = (1/10)Q - 10), and a sketch of the supply curve for Products Unlimited (P = (1/10)Q), then you can hold price constant and sum the quantity by these two firms at different prices. Thus, when the price is $0, the quantity supplied by the two firms is 100 units: Good Enterprises

will supply 100 units and Products Unlimited will supply 0 units. When the price is $15, the quantity supplied by the two firms is 400 units (150 units supplied by Products Unlimited and 250 units supplied by Good Enterprises). With two linear supply curves summed together horizontally we can see that when the price is 0, the sum will be equal to 100 units. The market supply curve will have a kink in it that occurs at a price of $0. For prices greater than or equal to $0, the market supply curve is $P = (1/20)Q - 5$. There is no need to put in a range here since we are only going to consider positive values for price. Let me show you how I found this and let me provide you with two methods:

Method One: I know that $(Q, P) = (100, \$0)$ and $(400, \$15)$ are two points on the market supply curve. So,

m = slope = $(0 - 15)/(100 - 400) = -15/-300 = 1/20$

$y = mx + b$ is the slope-intercept form. I will use this plus one of the points $(100, 0)$ to find the value of "b". This procedure should be starting to seem familiar to you: we use this procedure frequently in this class.

$P = (1/20)Q + b$

$0 = (1/20)(100) + b$

$b = -100/20 = -5$

$P = (1/20)Q - 5$ for prices greater than or equal to $0.

Method Two: I could use my algebra skills to find this equation. I am summing horizontally so if I write the two equations in x-intercept form and then add them together I can get the market supply curve. So, here is the work:

Supply for Good Enterprises:

  $P = (1/10)Q - 10$ in y-intercept form

  $Q = 10 P + 100$ in x-intercept form

Supply for Products Unlimited:

  $P = (1/10)Q$ in y-intercept form

  $Q = 10P$ in x-intercept form

Market Supply:

  $Qa + Qs = Qtotal$

  $Qtotal = (10 P + 100) + (10P)$

  $Q = 20P + 100$ in x-intercept form (note: that 100 is the x-intercept for the market supply curve)

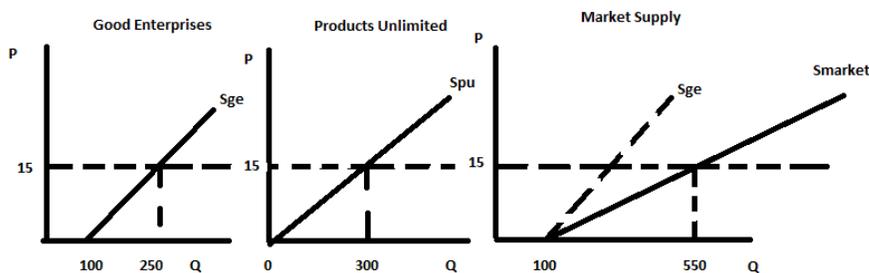 Or, $P = (1/20)Q - 5$ for prices greater than or equal to $0

d. Now Products Unlimited's supply curve will contain the points (300, 15) and (600, 30). (I drew a sketch to direct my work and so should you!) Draw a sketch of the original supply curve and note that when price is equal to $15 Products Unlimited supplies 150 units and when price is equal to $30, the quantity they supply is equal to 300 units. Then, think about what quantities they will supply at each of these prices now that their production has doubled at every price. They will produce (300, $15) and (600, $30). The new supply curve for Products Unlimited can be written as $P = (1/20)Q$.

e. You are now adding together the supply curve for Good Enterprises and the new supply curve for Products Unlimited. When you do this you will see that for prices greater than or equal to $0 the market supply curve is the horizontal summation of the two firms' individual supply curves. Thus, for prices equal to or greater than $0, the market supply curve is P = (1/30)Q - (10/3). For prices less than or equal to $0, the supply curve is not relevant (no firm is going to sell their product for a negative price) but if you wanted to see what this "supply curve" looked like, you would simply be looking at the Good Enterprises supply curve.

Here are two approaches to finding the new market supply curve.

Method One: Draw a sketch that shows the individual supply curves and the market supply curve. Use this sketch to guide the math work you need to do to get the equation(s) for the market supply curve. Here is the graph:

Method Two: I could use my algebra skills to find this equation. I am summing horizontally so if I write the two equations in x-intercept form and then add them together I can get the market supply curve. So, here is the work:
Good Enterprises' supply curve:
      P = (1/10)Q - 10 in y-intercept form
      Q = 10P + 100 in x-intercept form
Products Unlimited's new supply curve:
      P = (1/20)Q in y-intercept form
      Q = 20P in x-intercept form
The new Market Supply:
      Qge + Qpu = Qtotal
      Qtotal = (10P + 100) + (20P)
      Q = 30P + 100 in x-intercept form (note: that 100 is the x-intercept for the upper segment of the market supply curve)
      Or, P = (1/30)Q - (10/3) for prices greater than or equal to $0
Note: you can check that this equation works for some points that you know sit on the line: (Q, P) = (100, $0) and (550, $15). It does: I just checked it to make sure my math was right! And, I did not use a calculator throughout this entire problem.....best to not use one as you strengthen your numerical literacy!

3. Suppose that a small, closed economy manufactures pencils. There are five domestic manufacturers of these pencils and they have identical supply curves.

Suppose the supply curve for a single manufacturer of these pencils is given by the equation P = Q + 20. Additionally you know that the domestic demand for pencils in this small, closed economy is given by the equation P = 50 – (1/10)Q.

a. What is the domestic supply curve for pencils in this economy?

b. Given the domestic supply curve and the domestic demand curve, what is the equilibrium price and quantity of pencils in this economy if the economy is closed?

c. Calculate the value of consumer surplus, producer surplus, and total surplus if the domestic economy is a closed economy with regard to the pencil market.

d. Suppose that this economy decides to open this market to trade. Analyze what happens in this market if the world price of pencils is $45 per pencil. In your answer identify the level of imports or exports, the new level of consumer surplus, the new level of producer surplus, the new level of total surplus, and identify the distributional consequences of opening this market to trade.

e. Suppose that this economy decides to open this market to trade. Analyze what happens in this market if the world price of pencils is $30 per pencil. In your answer identify the level of imports or exports, the new level of consumer surplus, the new level of producer surplus, the new level of total surplus, and identify the distributional consequences of opening this market to trade.

f. Suppose that this market for pencils is opened to world trade and the world price is $30 per pencil. Furthermore, suppose that the government of this economy decides to implement a tariff so that the price of pencils in the small open economy is equal to $35 per pencil. Analyze the effect of this tariff on imports or exports, consumer surplus, producer surplus, total surplus, government tariff revenue and deadweight loss relative to the results you got when the market was open to trade and there was no tariff.

Answers:

a. A quick sketch of the firm supply curve may help you when you are working to find the market supply curve. You know that a single firm will produce 0 units when the price is $20 and 5 units when the price is $25. If there are five identical firms that implies that the five firms will produce 0 units when the price is $20 and 25 units when the price is $25. Thus, (0, $20) and (25, $25) are two points on the market supply curve. We can write the market supply curve as P = (1/5)Q + 20. An alternative method for finding this market supply curve: Rewrite the individual supply curve in x-intercept form: Q = P – 20 Then, add five of these curves together to get Qtotal: Qtotal = [P – 20] + [P – 20] + [P – 20] + [P – 20] + [P – 20] or

Qtotal = 5[P – 20] = 5P – 100
Rearrange this equation into y-intercept form:
5P = Q + 100
P = (1/5)Q + 20

b. Use the domestic supply curve and the domestic demand curve to solve for the equilibrium. Thus, (1/5)Q + 20 = 50 – (1/10)Q or Q = 100 units and P = $40.

c. Consumer surplus is equal to (1/2)($50/unit - $40/unit)(100 units) = $500. Producer surplus is equal to (1/2)($40/unit - $20/unit)(100 units) = $1000. Total surplus is equal to the sum of consumer surplus plus producer surplus or $1500.

d. When the world price is $45 per pencil and this economy opens to trade, domestic suppliers will supply 125 pencils while domestic consumers will demand 50 pencils. The excess supply of 75 pencils will be exported to the world market. Consumer surplus will equal (1/2)($50-$45)50 = $125 and will be smaller than it was when this market was closed to world trade. Producer surplus will equal (1/2)($45-$20)125 = $1562.50 and will be larger than it was when this market was closed to world trade. Trade is beneficial since total surplus will increase to $1687.50, an amount which is larger than the total surplus in this market when it is a closed market. Domestic consumers are hurt by the opening of this market , while domestic producers are benefitted.

e. When the world price is $30 per pencil and this economy opens to trade, domestic suppliers will supply 50 pencils while domestic consumers will demand 200 pencils. The excess demand of 150 pencils will be imported into this domestic economy. Consumer surplus will equal (1/2)($50-$30)200 = $2000 and will be larger than it was when this market was closed to world trade. Producer surplus will equal (1/2)($30-$20)50 = $250 and will be smaller than it was when this market was closed to world trade. Trade is beneficial since total surplus will increase to $2250 which is larger than the total surplus in this market when it is a closed market. Domestic producers are hurt by the opening of this market while domestic consumers are benefitted.

f. The imposition of this tariff will reduce the level of imports in this economy from 150 units to 75 units since at a price of $35 per pencil domestic producers are willing to produce 75 pencils while domestic consumers will demand 150 pencils. The difference, or 75 pencils, will be imported into this economy. Consumer surplus with the tariff will equal (1/2)($50-$35)150 = $1125 instead of $2000 when the economy is open to trade. Producer surplus with the tariff will equal (1/2)($35-$20)75 = $562.50 instead of $250 when the economy is open to trade. Government tariff revenue will equal ($5)65 = $375. Deadweight loss will equal $187.50. To find deadweight loss: DWL = (1/2)($35/unit - $30/unit)(75 units – 50 units) + (1/2)($35/unit - $30/unit)(200 units – 150 units) = $187.50.

4. Here are a variety of situations to analyze.

a. Bicycles Galore produces 200 bicycles and sells 150 bicycles for $200 per bicycle in 2013; produces 300 bicycles and sells 350 bicycles for $150 per bicycle in 2014; and produces 400 bicycles and sells 300 bicycles for $200 per bicycle in 2015. What is GDP in this economy in 2013, 2014, and 2015 if Bicycles Galore is the only producer of final goods and services in this economy?

b. Fast Wheels produces 300 bicycles in 2013 and sells 150 of them to domestic customers at $200 per bicycle, and they sell 100 bicycles for $200 per bicycle to consumers in France. In 2014 Fast Wheels produces 250 bicycles and sells 200 of them to domestic buyers at $300 per bicycle and 100 bicycles for $300 per bicycle to Italian consumers. What is GDP in this economy in 2013 and 2014 if Fast Wheels is the only producer of final goods and services in this economy?

Answers:

a. Using the definition of GDP as the sum of the products of the price of the each good times the quantity of each good we get: GDP in 2013 = (200 bicycles)($200 per bicycle) = $40,000. We can also use the expenditure approach to get GDP in 2013 = consumption spending + investment spending. Consumption spending = (150 bicycles)($200 per bicycle) = $30,000. Investment spending = change in inventories = (50 bicycles)($200 per bicycle) = $10,000. Notice that both methods give us the same value for GDP in 2013.

GDP in 2014: GDP = (300 bicycles)($150 per bicycle) = $45,000. Using the expenditure approach: consumption spending = (350 bicycles)($150 per bicycle) = $52,500 and investment spending in the form of decreases in inventory = (-50 bicycles)($150 per bicycle) = -$7,500. Notice that both methods give us the same value for GDP in 2014.

GDP in 2015: GDP = (400 bicycles)($200 per bicycle) = $80,000. Using the expenditure approach: consumption spending = (300 bicycles)($200 per bicycle) = $60,000 and investment spending in the form of increases in inventory = (100 bicycles)($200 per bicycle) = $20,000. Notice that both methods give us the same value for GDP in 2015.

b. GDP in 2013 is equal to (300 bicycles)($200 per bicycle) = $60,000. Using the expenditure approach, GDP in 2013 = consumption spending + investment spending + net exports = (150 bicycles)($200 per bicycle) + (50 bicycles)($200 per bicycle) + (50 bicycles)($200 per bicycle) = $30,000 + $20,000 + $10,000 = $60,000. Notice that both methods give us the same value for GDP in 2013.

GDP in 2014 = (250 bicycles)($300 per bicycle) = $75,000. Using the expenditure approach, GDP in 2014 = consumption spending + investment spending + net exports = (200 bicycles)($300 per bicycle) + (-50 bicycles)($300 per bicycle) + (100

bicycles)($300 per bicycle) = $60,000 - $15,000 + $30,000 = $75,000. Notice that both methods give us the same value for GDP in 2014.

5. Suppose you are given the following information about an economy for the year 2016.

Consumption Expenditures	$40,000
Business Expenditure on Plant and Equipment	$10,000
Tax Revenues	$12,000
Imports	$8,000
Government Expenditures	$20,000
Inventory Change for the Year	$1000
Exports	$9,000
Government transfer payments	$3,000
New Home Construction	$5,000

a. Given the above information, is this economy a net exporter or a net importer?

b. Given the above information, what is the level of investment in this economy for 2016?

c. Suppose we define the government budget balance as being equal to government expenditures minus net taxes. Furthermore, suppose that net taxes are equal to tax revenues minus transfer payments from the government. What is the government budget balance for this economy? Is the government operating with a surplus, a deficit, or a balanced budget? Explain your answer.

d. What is the value of GDP in 2016 for this economy?

Answers:

a. Exports are equal to $9,000 while imports are equal to $8,000. This country exports more than it imports, so this country is a net exporter (it has a trade surplus).

b. Investment is equal to the sum of business expenditure on plant and equipment plus new home construction plus inventory change. Thus, in this example investment is equal to $10,000 + $5,000 + $1000 = $16,000.

c. Net taxes in this example are equal to $12,000 - $3,000 = $9,000. The government budget balance is therefore equal to $20,000 - $9,000 = $11,000. The government is running a deficit since its expenditures are greater than its net tax revenues.

d. GDP = C + I + G + (X – M) = $40,000 + $16,000 + $20,000 + $1,000 = $77,000.