

Economics 102
Fall 2015
Homework #1
Due Monday, September 21, 2015

Directions:

- The homework will be collected in a box **before** the large 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, 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!

1. Math Review Question:

a. Find the solution (x,y) that satisfies both of the following equations:

$$\text{Equation 1: } 2x + 3y = 13$$

$$\text{Equation 2: } 3x - 2y = 0$$

b. Suppose that both Equation 1 and 2 have both shifted to the right. For each equation the shift is the same size and can be described as follows: for every initial value of the y variable the new x variable is 2 units larger than the initial x value. (Hint: you may find it helpful to draw a sketch of these two lines on separate graphs to see how the new line compares to the original line.)

i) Write down the new equations that represent these described changes.

ii) Given the new equations, find the solution (x,y) that represents the intersection of these two lines.

iii) Then, compare the initial intersection point to the new intersection point.

c. Consider the two equations below where P is measured on the vertical axis and Q is measured on the horizontal axis:

$$P = 8 - 2Q \text{ for } 0 \leq Q$$

$$P = 2Q \text{ for } 0 \leq Q$$

Calculate the equilibrium values for (Q, P). Then, calculate the area that sits between these two equations for all positive values of Q less than or equal to the equilibrium value of Q. (Hint: This area is a triangle and you might find it helpful to draw a sketch

of the two lines, their solution, and the area you are calculating.)

2. Math Review Question:

For this question assume you are working with a linear equation that takes the general form of $y = ax + b$ where y is the variable measured on the vertical axis, x is the variable measured on the horizontal axis, "a" is the slope of the equation, and "b" is the y-intercept for the equation.

- a. Write the equation for the straight line that passes through the origin and the point (2, 4). In your answer show the work you did to find this equation. Then graph this equation. In your equation, what is the value of the slope of the equation and the value of the y-intercept.
- b. Write the equation for the straight line that passes through the points $(x, y) = (1, 3)$ and $(3, 4)$. Show the work you did to find this equation. Graph this line. What are the values of the y-intercept and slope for this line?
- c. Consider the two lines you found in (a) and (b). Do these two lines intersect one another? If so, what are the coordinate values (x, y) for this point of intersection for the two lines. Show your work.
- d. Suppose the line you found in (b) is shifted horizontally to the right by 3 units. Given this information, write the equation for this new line? Show your work. Then, draw a graph that represents the initial line as well as this new line.
- e. Can you draw a single straight line that passes through all three of the following three points:
 $(X, Y) = (1, 3), (2, 4),$ and $(4, 5)$
Explain your answer fully.

3. Percentage change:

James took a math course that had three exams. He got a 30 out of 75 points on the first exam, and a 50 out of 75 points on the second. On the last exam, he scored 80 out of 100 points.

- a. What is the percentage change in score from the first to the second exam? Show your work and provide any formulas you use in your calculation.
- b. What is James's grade on the third exam if that score is converted to a 75 point scale? Show your work and explain your reasoning (this means include a verbal response!).
- c. What are James's grades on the first and second exam if those scores are converted

to a 100 point scale? Show your work and explain your reasoning (this means include a verbal response!).

d. What is the percentage change in score from the first to the third exam if using a 100 point scale for both exam scores? When you use 75 point scale instead of 100 point scale, is the percentage change result different? Show your work and explain your reasoning (this means include a verbal response!).

4. PPF and comparative advantage: In his famous book *The Wealth of Nations*, published in 1776, Adam Smith illustrated the benefit of international trade using the example of two countries, England and Portugal. Assume, hypothetically, that in a given year England could produce woolen cloth and wine in the following combinations:

England	Cloth (in pieces)	Wine (in bottles)
Combination 1	10	5
Combination 2	20	0

Portugal, benefitting from a more pleasant climate, could produce:

Portugal	Cloth (in pieces)	Wine (in bottles)
Combination 1	15	15
Combination 2	20	10

For this set of questions assume that both countries face constant opportunity cost and therefore both countries have linear production possibility frontiers.

a. Given the above information, what is the opportunity cost for England to produce one additional piece of cloth in terms of bottles of wine? What is the opportunity cost for England to produce one additional bottle of wine in terms of cloth? What is the opportunity cost for Portugal to produce one additional piece of cloth in terms of bottles of wine? What is the opportunity cost for Portugal to produce an additional bottle of wine in terms of cloth?

b. Draw the Production Possibility Frontiers for both countries on a single graph. Measure cloth on the vertical axis of your graph and wine on the horizontal axis. Label each Production Possibility Frontier clearly and completely, including the horizontal and vertical intercepts for each PPF. Which country has the absolute advantage in the production of cloth? Explain your answer fully. Which country has the comparative advantage in the production of cloth? Explain your answer.

c. Now, imagine the two countries engage in trade. Which country will export cloth, and which country will export wine? Draw a well labeled graph of the joint production

possibility frontier for these two countries if they specialize according to comparative advantage and trade with one another. In your graph, measure wine on the horizontal axis and cloth on the vertical axis. In your graph, identify the coordinate values for any "kink point". Write the equation(s) for the joint PPF. (Note: there may be more than one equation here-so provide information about which equation is right for which segment of your joint PPF.)

d. Assume that after specialization and trade, the two countries in total will produce 25 pieces of cloth and 15 bottles of wine. Given this production combination how many pieces of cloth and how many bottles of wine does England produce? How many pieces of cloth and bottles of wine does Portugal produce? Is this production combination efficient? Explain your answer fully.

e. According to a report from MIT, Portugal today (2015) is a net exporter of refined petroleum. What does this fact tell us about Portugal's productivity in terms of refined petroleum? Explain your answer fully.

5. **Comparative advantage:** The following table describes the amount of labor Roy and Steve each needs to produce a pencil or an eraser. Assume that both Roy and Steve have linear PPFs and that they each can devote 60 hours a week to the production of pencils and/or erasers.

	The Amount of Labor Needed to Produce One Pencil	The Amount of Labor Needed to Produce One Eraser
Roy	4 Hours of Labor	6 Hour of Labor
Steve	2 Hours of Labor	4 Hours of Labor

a. Given the above information, calculate Roy's opportunity cost of producing one pencil and one eraser in terms of the other good, respectively.

b. Calculate Steve's opportunity cost of producing one pencil and one eraser in terms of the other good, respectively.

c. State who has the comparative advantage in the production of pencils and erasers, respectively. Explain your answer.

d. Now assume that Roy can devote 120 hours per week on the production of pencils and/or erasers while Steve continues to only have 60 hours per week that he can devote to this production. State who has the comparative advantage in the production of the pencils and erasers, respectively. Is there any difference between the results you found in answers (c) and (d)? Explain your answer.

e. Given your work in this question, provide an illustration of the acceptable range of trading prices in terms of erasers for 10 pencils. Use the number line approach presented

in class and make sure you designate in your diagram arrows indicating Roy's as well as Steve's perspective with regard to acceptable trading prices.