Economics 102
Fall 2017
Answers to Homework #1
Due 9/26/2017

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!

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 two pairs of coordinates that have a linear relationship. The two pairs of coordinates are (x, y) = (30, 70) and (20, 50).

a. Find the expression of the line (Line 1) that goes through these two points in y-intercept form.

b. In this linear relationship, if the level of x increases by 13, what is the resulting change in y?

c. There is another linear relationship represented by the following expression:

(Line 2): y = 90 – 4x

Find the (x, y) solution that represents the intersection of these two lines.

d. Now Line 1 is shifted in such way that for every x value, the y value is 40 units smaller, at the same time Line 2 is shifted in such way that for every y value, the x value is 10 units larger. Represent these shifts in a clearly labelled graph measuring X along the horizontal axis and y along the vertical axis. In your graph represent both the initial lines (Line 1 and Line 2) and the new lines (Line 1' and Line 2'). Does the new intersection have a larger x value compared to the original x value calculated in part (c)? At the new intersection of these two new lines, is the new y value larger or smaller than the initial y value?

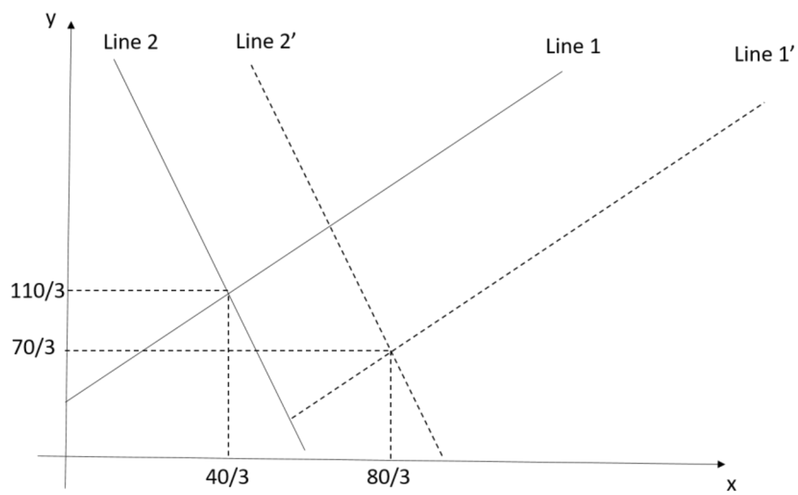
SOLUTION:

a. Start by finding the slope of the equation using the two points: slope = (change in y)/(change in x) = (70 - 50)/(30 – 20) = 2. Then, use the slope-intercept form, y = mx + b, to find the equation for the line. Thus, y = 2x + b. Then, plugging in one of the given point-in this case, let's use (30, 70) we get 70 = 2(30) + b or b = 10. The equation is therefore y = 2x + 10.

b. The change in y is given by the change in x multiplied by the slope: (change in y) = slope*(change in x) = 2*13 = 26.

c. To find where these two lines intersect, set the two equations equal to one another:
2x + 10 = 90 - 4x
6x = 80
x = 80/6 = 40/3
y = 2x +10 = 2(40/3) + 10 = 110/3
Or, y = 90 - 4(40/3) = 110/3
(x, y) = (40/3, 110/3) or (13.33, 36.67)

d. Line 1 is shifted downward by 40 units and Line 2 is shifted rightward by 10 units.
The new expression for Line 1 is y = 2x + 10 – 40 = 2x - 30, the new expression for Line 2 is y = 90 - 4(x - 10) = 130 - 4x.
To find where these two lines intersect, set the two equations equal to one another:
2x - 30 = 130 - 4x
6x = 160
x = 160/6 = 80/3
y = 2x -30 = 2(80/3) – 30 = 70/3
Or, y = 130 - 4(80/3) =70/3
(x, y) = (80/3, 70/3) or (26.67, 23.33)
Compared to the original intersection calculated in part (c), the new intersection has a larger x value and a smaller y value.
Graph:



2. The price of money is called the interest rate. Suppose that when the interest rate is 3%, the supply of loans is $15,000 and when the interest rate is 7% the supply of loans is $20,000.

Assume the relationship between the quantity of loans supplied (L) and the interest rate (r) is linear.

a. Write an equation for this relationship in L-intercept form.

b. What would the equation for this relationship be if it was written in r-intercept form?

SOLUTION:

a. We know that the two points (r, L) = (3,15000) and (7,20000) both sit on this line. We also know the slope intercept form y = mx + b and we can rewrite this general formula using our two variables as L = mr + b since the quantity of loan supplied, L, is the variable measured on the vertical axis and the interest rate, r, is the variable measured on the horizontal axis. We then need to calculate the slope of this line using the two given points:
m = (20000 - 150000)/(7 - 3) = 5000/4 = 1250
To find the value of "b", substitute in the coordinates of a point that you know is on this line: (r, L) = (3, 15000)
15000 = 1250*3 + b
b = 15000 - 1250*3 = 11250
L = 1250r + 11250 is the equation for this relationship.

b. To write the equation in r-intercept form we simply need to solve the y-intercept form for "r". Thus,
L = 1250r + 11250
1250r = L – 11250
r = (1/1250)L - 9

3. The closing price of Amazon (AMZN) on Sept. 5, 2017 was $965 and that on Sept. 7, 2017 the closing price was $979. On Sept. 8, 2017, the closing price of Amazon (AMZN) was $965.

a. What was the percentage change in the closing price of Amazon's (AMZN) stock price between Sept. 5, 2017 and Sept. 7, 2017?

b. What was the percentage change in the closing price of Amazon's (AMZN) stock price between Sept. 5, 2017 and Sept. 8, 2017?

c. What was the percentage change in the closing price of Amazon's (AMZN) stock price between Sept. 7, 2017 and Sept. 8, 2017?

d. In both part (a) and (c) you are calculating percentage changes and the relevant numbers in both examples are $965 and $979, do you get the same answers? Explain your answer.

SOLUTION:
a. Percentage change in Amazon's (AMZN) closing stock price between Sept. 5, 2017 and Sept. 7, 2017 = [(New price - Initial price)/(Initial price)[*(100%)] = [(979 – 965)/(965)]*100% = (0.0145)(100%) = 1.45%. Amazon's (AMZN) closing stock price increased by 1.45% between Sept. 5, 2017 and Sept. 8, 2017.

b. Percentage change in Amazon's (AMZN) closing stock price from Sept. 5, 2017 and Sept. 8, 2017 = [(New price - Initial price)/(Initial price)[*(100%)] = [(965 – 965)/(965)]*100% = (0)(100%) = 0%. Amazon's (AMZN) closing stock price did not change between Sept. 5, 2017 and Sept. 8, 2017.

c. Percentage change in Amazon's (AMZN) closing stock price from Sept. 7, 2017 and Sept. 8, 2017= [(New price - Initial price)/(Initial price)[*(100%)] = [(965 – 979)/(979)]*100% = (-0.0143)(100%) = -1.43%. Amazon's (AMZN) closing stock price decreased by 1.43% between Sept. 7, 2017 and Sept. 8, 2017.

d. Even though both (a) and (c) are measuring percentage changes and they both use $965 and $979 you do not get the same answers. That is because the base value, or the initial value, is different in the two questions. The choice of base matters in measuring percentage changes.

4. Steven, Yunhan, and Lois produce bagels (B) and cupcakes (C) for the Economics department. They all have linear production possibility frontiers. Steven knows that he can produce (C, B) = (10, 20) and (40, 15) or any other combination of these two goods that lies on the line containing these two points. Yunhan knows that the maximum number of bagels he can produce is 30 and the maximum number of cupcakes he can produce is 100. Lois knows that she must give up 4 cupcakes for every bagel she produces. Lois is currently producing 25 bagels and 20 cupcakes.

a. Represent the production possibility frontiers for Steven, Yunhan and Lois in three clearly labeled graphs. Please measure cupcakes (C) on the horizontal axis and bagels (B) on the vertical axis.

b. Write out the B-intercept form expressions of the individual PPFs for Steven, Yunhan and Lois.

c. Who has the absolute advantage in producing bagels (B) and cupcakes (C)?

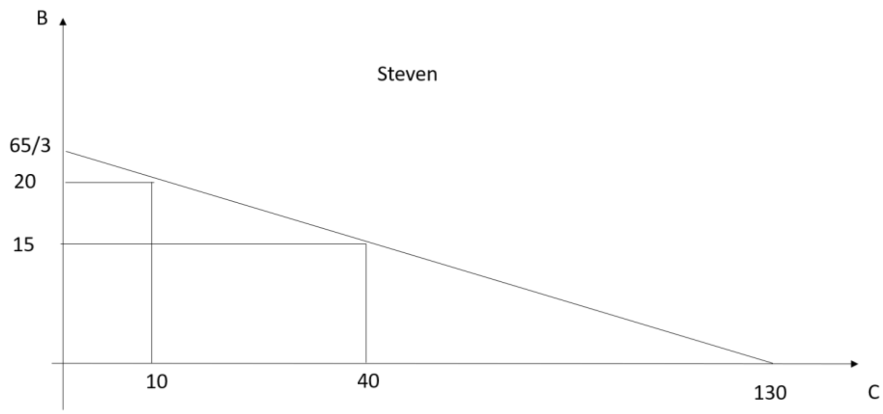
d. Who has the comparative advantage in producing bagels (B) and cupcakes (C)?

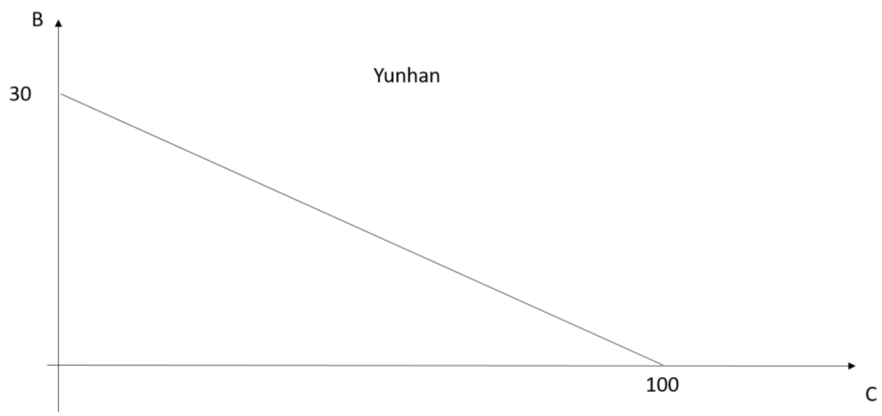
e. Construct Steven, Yunhan, and Lois's joint PPF in a clearly labeled graph. Please measure cupcakes (C) on the horizontal axis and bagels (B) on the vertical axis. Identify the y-intercept, the x-intercept, and the coordinates of any "kink points" in your graph.

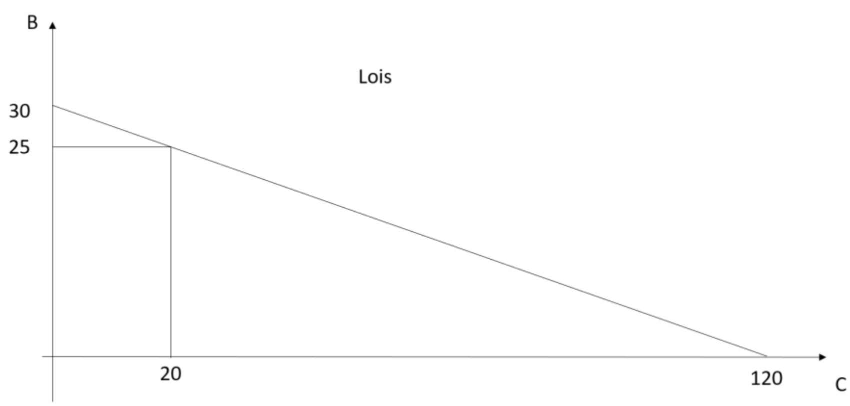
f. Write out the expression (that is, the equation) and the corresponding range for each segment of the joint PPF.

g. Use the number line approach to illustrate the acceptable range of trading prices for one bagel (B) in terms of cupcakes (C) for Steven, Yunhan and Lois.

SOLUTION:
a. Graphs of the individual PPFs:





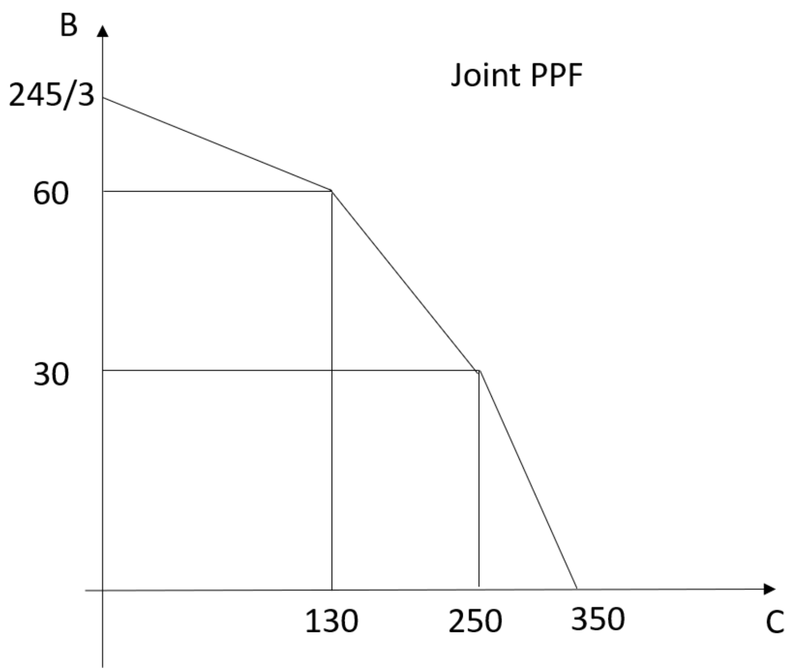


b. Steven: The slope for Steven's PPF is (20 - 15)/(10 - 40) = -1/6. The y-intercept of Steven's PPF b satisfies 20 = (-1/6)*10 + b, so b = 20 + 5/3 = 65/3, so the expression for Steven's PPF is B = (-1/6)C + 65/3.
Yunhan: The slope for Yunhan's PPF is (30 - 0)/(0 - 100) = -3/10. The y-intercept of Yunhan's PPF can be read directly from the graph which is 30, so the expression for Yunhan's PPF is B = (-3/10)C + 30.
Lois: The slope for Lois's PPF is -1/4 because she must give up 4 cupcakes for every bagel she produces. The y-intercept of Lois's PPF b' satisfies 25 = (-1/4)*20 + b', so b' = 25 + 5 = 30, so the expression for Lois's PPF is B = (-1/4)C + 30.

c. Yunhan and Lois have the absolute advantage in producing bagels (B) because they each have the potential to produce 30 bagels (compared to Steven's 65/3). Steven has the absolute advantage in producing cupcakes (C) because he has the potential to produce 135 cupcakes (compared to Yunhan's 100 and Lois's 120).

d. Yunhan has the comparative advantage in producing bagels (B) because he gives up only 10/3 cupcakes (C) to produce one unit of bagel (compared to Steven's 6 and Lois's 4). Steven has the comparative advantage in producing cupcakes (C) because he gives up only 1/6 bagels to produce one unit of cupcake (compared to Yunhan's 3/10 and Lois's 1/4).

e. Graph for the joint PPF:



f. In the top segment of the joint PPF, only Steven is producing cupcakes (C) and Yunhan and Lois are producing bagels (B). The expression for this segment is B = 245/3 - (1/6)C for 0 ≤ C ≤ 135.
In the middle segment, both Steven and Lois are producing cupcakes (C) and only Yunhan is producing bagels (B). We can look at the graph and see that the slope of the segment is (60 -

30)/(255 - 135) = -1/4. We then use one of our points that we know is on this segment to solve for the y-intercept of this equation. We know (C, B) = (135, 60) and (255, 30) both sit on this segment. Thus, B = (-1/4)C + b and using one of our points: 60 = (-1/4)(135) + b and thus, b = 60 + 135/4 = 375/4. The equation for the middle segment is therefore B = - (1/4)C + 375/4 for $135 \leq C \leq 255$.

In the bottom segment, all three are producing cupcakes (C). The slope of this segment is (30 - 0)/(255 - 355) = -3/10. And we know that (C, B) = (255, 30) and (355, 0) both sit on this segment. Thus, B = (-3/10)C + b and using one of our points: 0 = (-3/10)(355) + b and thus, b = 213/2. The equation for the lowest segment of the joint PPF is therefore B = (-3/10)C + 213/2 for $255 \leq C \leq 355$.

g. Here is the number line illustrating the range of trading prices for 1 bagel (B):
Trade takes place when price is above the production cost to the seller but below the production cost to the buyer.