



**B.E. International Program
Faculty of Economics
Thammasat University**



EE311 Microeconomics Theory, Semester 1/2019

Homework Assignment #2 | Due date: Friday 13 September 2019
(in-class submission, before lecture begins!)

Instruction:

- 1) Attempt all questions.
- 2) You may study and discuss in group but you have to write up your solutions independently and by handwriting only. Copying and/or Plagiarism is considered as a serious crime in academic arena and it will not be tolerated. If detected, all parties involved receive 'zero.'
- 3) If you have any questions, please feel free to email me at pwrasai@econ.tu.ac.th

Consumer Choice (CH 4)

1. a) At an optimal interior basket, interpret the following condition.

$$\frac{MU_x}{P_x} = \frac{MU_y}{P_y}$$

- b) At a corner point solution, state the condition where the consumer will only buy good Y. Explain why the consumer will choose to do so (i.e., interpret the condition).

6. Consider a consumer with the utility function $U(x, y) = \min(3x, 5y)$, that is, the two goods are perfect complements in the ratio 3:5. The prices of the two goods are $P_x = \$5$ and $P_y = \$10$, and the consumer's income is \$220. Determine the optimum consumption basket.

Hint:

- 1) The ratio 3:5 implies that $3x = 5y$, so if $x = 5$, then we will get $y = 3$ and $U = 15$. Any bundle that has more of one good, such as $(x, y) = (6, 3)$ would still give $U = 15$ but with higher cost.
- 2) Use the condition $3x = 5y$ and the BL to solve for the optimal bundle.

7. Jane likes hamburgers (H) and milkshakes (M). Her indifference curves are bowed in toward the origin and do not intersect the axes. The price of a milkshake is \$1 and the price of a hamburger is \$3. She is spending all her income at the basket she is currently consuming, and her marginal rate of substitution of hamburgers for milkshakes (MRS_{HM}) is 2. Is she at an optimum? If so, show why. If not, should she buy fewer hamburgers and more milkshakes, or the reverse?

8. The utility that Corey obtains by consuming hamburgers (H) and hot dogs (S) is given by $U(H, S) = \sqrt{H} + \sqrt{S + 4}$. The marginal utility of hamburgers is $\frac{0.5}{\sqrt{H}}$ and the marginal utility of steaks is equal to $\frac{0.5}{\sqrt{S+4}}$. Suppose that the price of hamburgers is \$1 per hamburger, and the price of steak is \$8 per steak. Moreover, suppose that Corey can spend \$100 per month on these two foods.

c) What is Corey's optimal consumption basket given his budget?

Hint

- 1) First, check whether it has an interior solution.
- 2) If not, check whether the IC or BL has greater slope for a corner solution.

10. Sara views chocolate and vanilla ice cream as perfect substitutes. She likes both and is always willing to trade one scoop of chocolate for two scoops of vanilla.

a) Given the statement above, what is her MRS_{cv} ?

b) If the price of a scoop of chocolate ice cream is three times the price of vanilla, will Sara buy both types of ice cream? If not, which will she buy?

12. (**Quantity Discount**) Toni likes to purchase round trips between the cities of Pulmonia and Castoria and other goods out of her income of \$10,000. Fortunately, Pulmonian Airways provides air service and has a frequent-flyer program. Around trip between the two cities normally costs \$500, but any customer who makes more than 10 trips a year gets to make additional trips during the year for only \$200 per round trip.

a) On a graph with round trips on the horizontal axis and “other goods” on the vertical axis, draw Toni’s budget line.

b) On the graph you drew in part (a), draw a set of indifference curves that illustrates why Toni may be better off with the frequent-flyer program.

c) On a new graph draw the same budget line you found in part (a). Now draw a set of indifference curves that illustrates why Toni might not be better off with the frequent-flyer program.

Hint:

- 1) To answer Questions b and c, you should think about the optimality condition. Suppose that $MU_x/MU_y > P_x/P_y$, then you should consume more X to increase your utility. Try to draw ICs that reflect this concept.

14. A student consumes root beer and a composite good whose price is \$1. Currently, the government imposes an excise tax of \$0.50 per pack of root beer. The student now purchases 20 packs of root beer per month. (Think of the excise tax as increasing the price of root beer by \$0.50 per pack over what the price would be without the tax.) The government is considering eliminating the excise tax on root beer and, instead, requiring consumers to pay \$10.00 per month as a lump sum tax (i.e., the student pays a tax of \$10.00 per month, regardless of how much root beer is consumed). If the new proposal is adopted, how will the student's consumption pattern (in particular, the amount of root beer consumed) and welfare be affected? (Assume that the student's marginal rate of substitution of root beer for other goods is diminishing.)

Hint:

1) To answer this question, it is better to draw a diagram. You can assume that the consumer has income = I and price of root beer = P .

2) First, you can draw the original BL (with price of root beer = $P + 0.5$) and the tangent IC. This is the BL where the government currently imposes the tax.

Original BL: $(P+0.5)X + Y = I$.

Note that the slope of this BL is equal to the slope of the tangent IC.

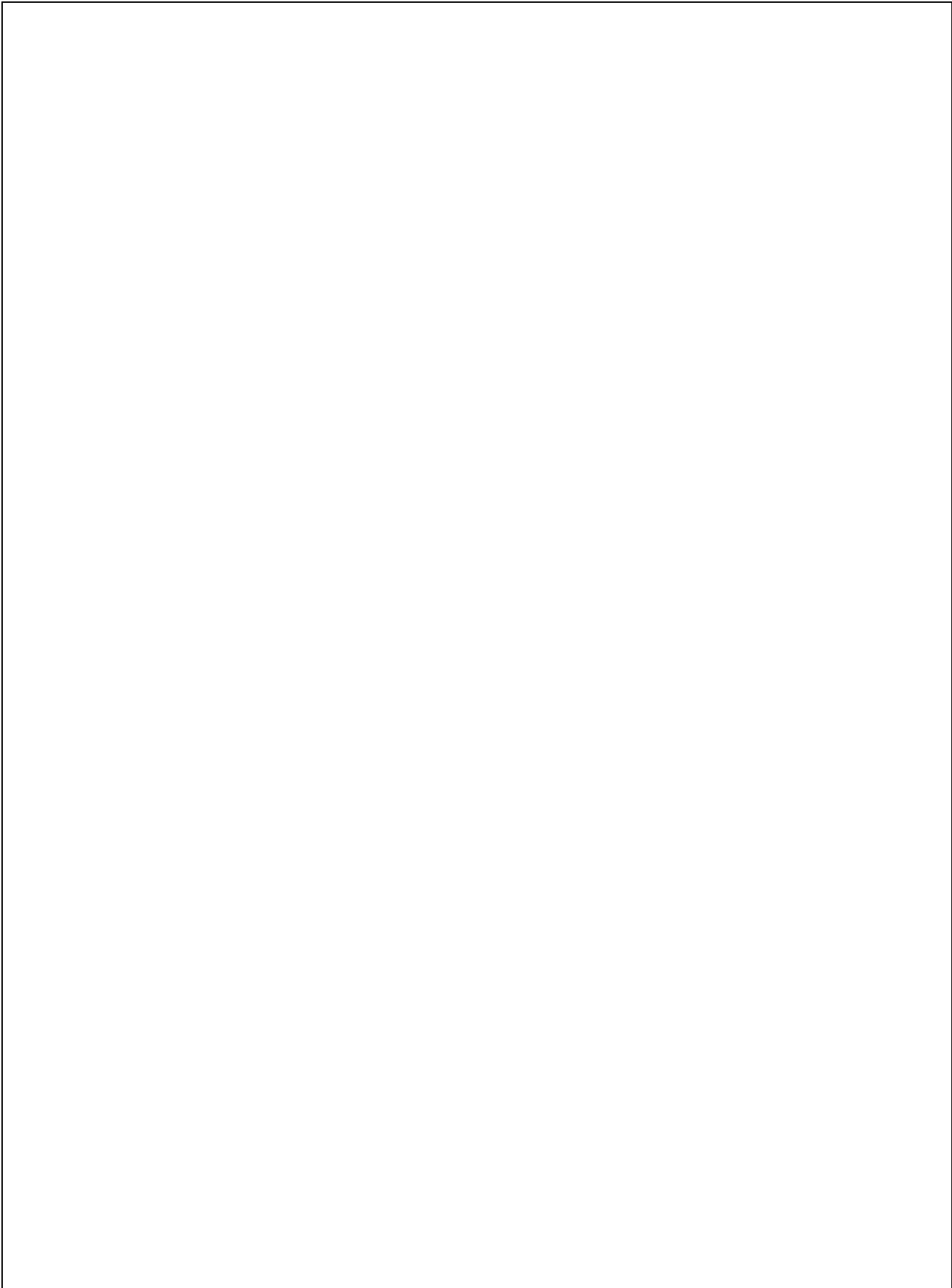
3) Second, you can draw the new BL after the proposal is adopted. In the proposal, price of root beer = P because it removes tax. However, the consumer has to pay lump-sum tax of \$10 instead. In this case, his income falls to $I - 10$.

New BL:

****Try to write it by yourself.****

4) You should check whether $X = 20$ is on both BLs. (Of course, it is.)

5) Now, check whether the optimality condition holds at $X = 20$ on the new BL. That is, compare the slopes of new and old BLs.



15. (**Cash Subsidy**) When the price of gasoline is \$2.00 per gallon, Joe consumes 1,000 gallons per year. The price increases to \$2.50, and to offset the harm to Joe, the government gives him a cash transfer of \$500 per year. Will Joe be better off or worse off after the price increase and cash transfer than he was before? What will happen to his gasoline consumption? (Assume that Joe's marginal rate of substitution of gasoline for other goods is diminishing.)

Hint:

1) To answer this question, it is better to draw a diagram. You can assume that the consumer has income = I and price of gasoline = P .

2) First, you can draw the original BL (with $P = 2$) and the tangent IC.

Original BL: $(2)X + Y = I$.

Note that the slope of this BL is equal to the slope of the tangent IC.

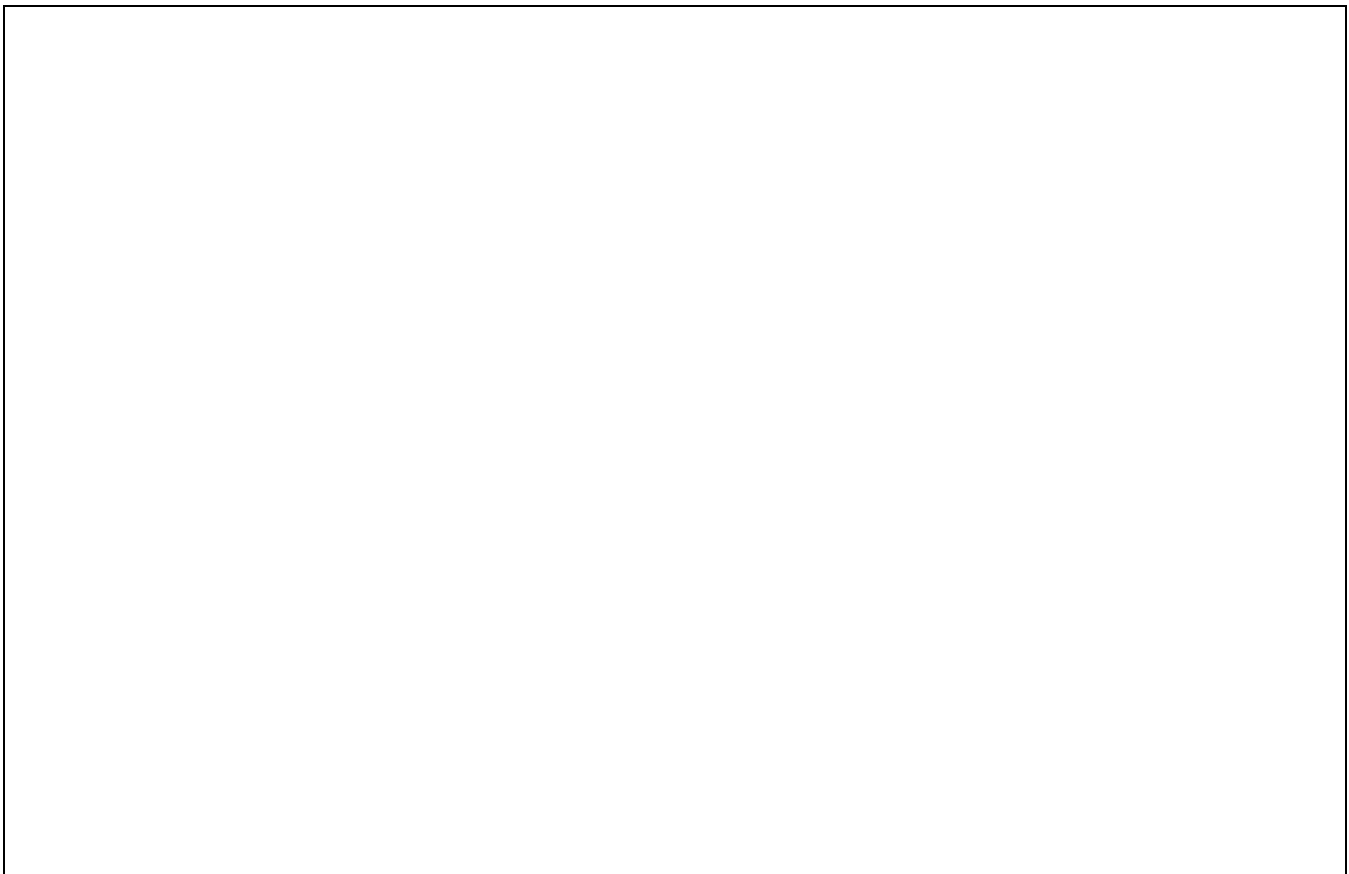
3) Second, you can draw the new BL after the price change. Now, $P = 2.5$, but income = $I + 500$ since the government gives him a cash subsidy.

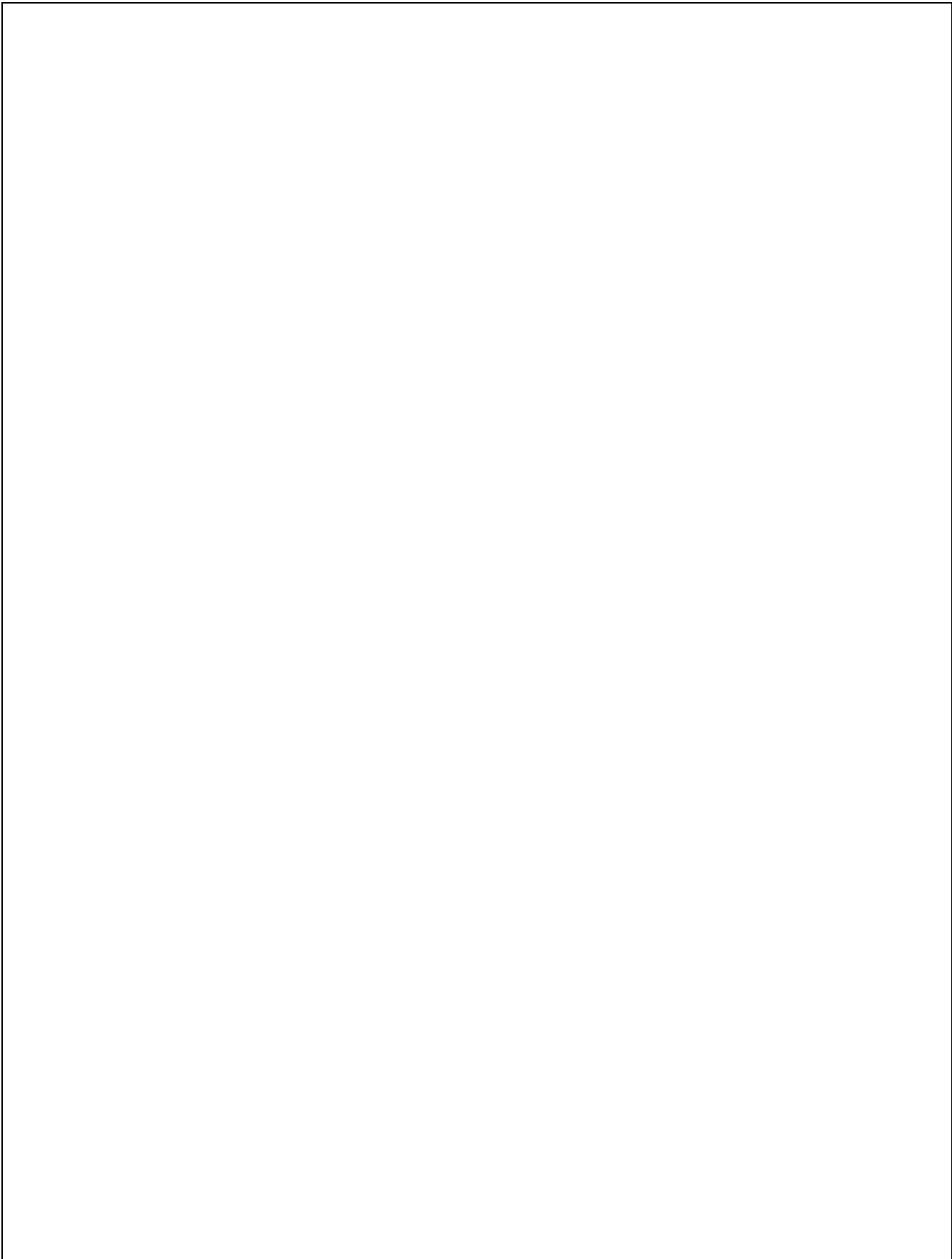
New BL:

****Try to write it by yourself.****

4) You should check whether $X = 1000$ is on both BLs. (Of course, it is.)

5) Now, check whether the optimality condition holds at $X = 1000$ on the new BL. That is, compare the slopes of new and old BLs.

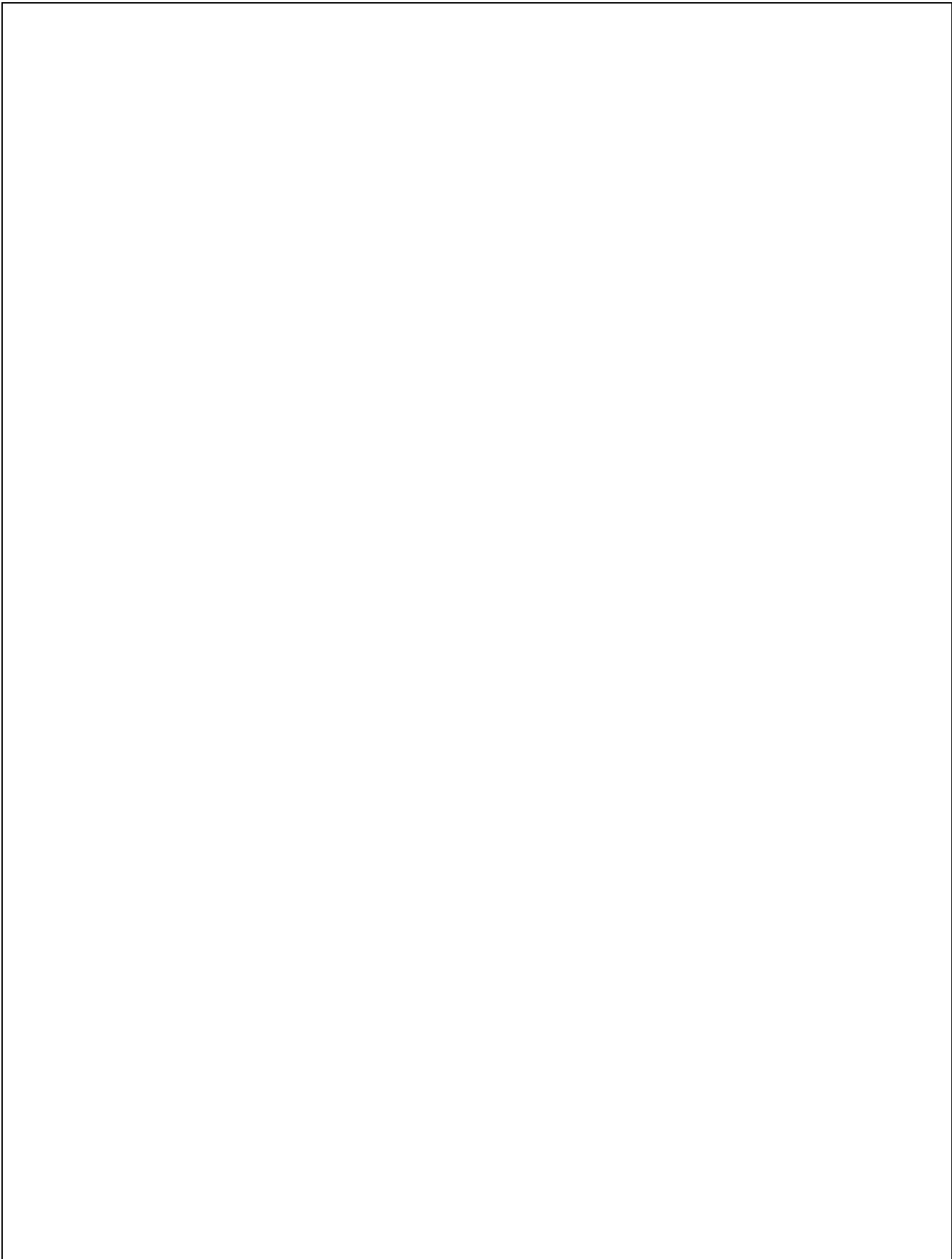




16. (**Voucher and Cash Subsidy**) Paul consumes only two goods, pizza (P) and hamburgers (H) and considers them to be perfect substitutes, as shown by his utility function: $U(P, H) = P + 4H$. The price of pizza is \$3 and the price of hamburgers is \$6, and Paul's monthly income is \$300. Knowing that he likes pizza, Paul's grandmother gives him a birthday gift certificate of \$60 redeemable only at Pizza Hut. Though Paul is happy to get this gift, his grandmother did not realize that she could have made him exactly as happy by spending far less than she did. How much would she have needed to give him in cash to make him just as well off as with the gift certificate?

Hint:

- 1) First, you should show that Paul will only consume Hamburger to maximize his utility, i.e. a corner solution.
- 2) But with a voucher from his grandma, he is going to buy some pizza (he will buy $60/3 = 20$ pizzas).
- 3) Find his utility from consuming only hamburger from the money he has and 20 pizzas from the voucher.
- 4) Find the cash subsidy that would allows him to reach the same utility.



17. (**Borrowing and Lending**) Jack makes his consumption and saving decisions two months at a time. His income this month is \$1,000, and he knows that he will get a raise next month making his income \$1,050. The current interest rate (at which he is free to borrow or lend) is 5 percent. Denoting this month's consumption by x and next month's by y , for each of the following utility functions state whether Jack would choose to borrow, lend, or do neither in the first month.

(**Hint:** In each case, start by assuming that Jack would simply spend his income in each month without borrowing or lending money. Would doing so be optimal?)

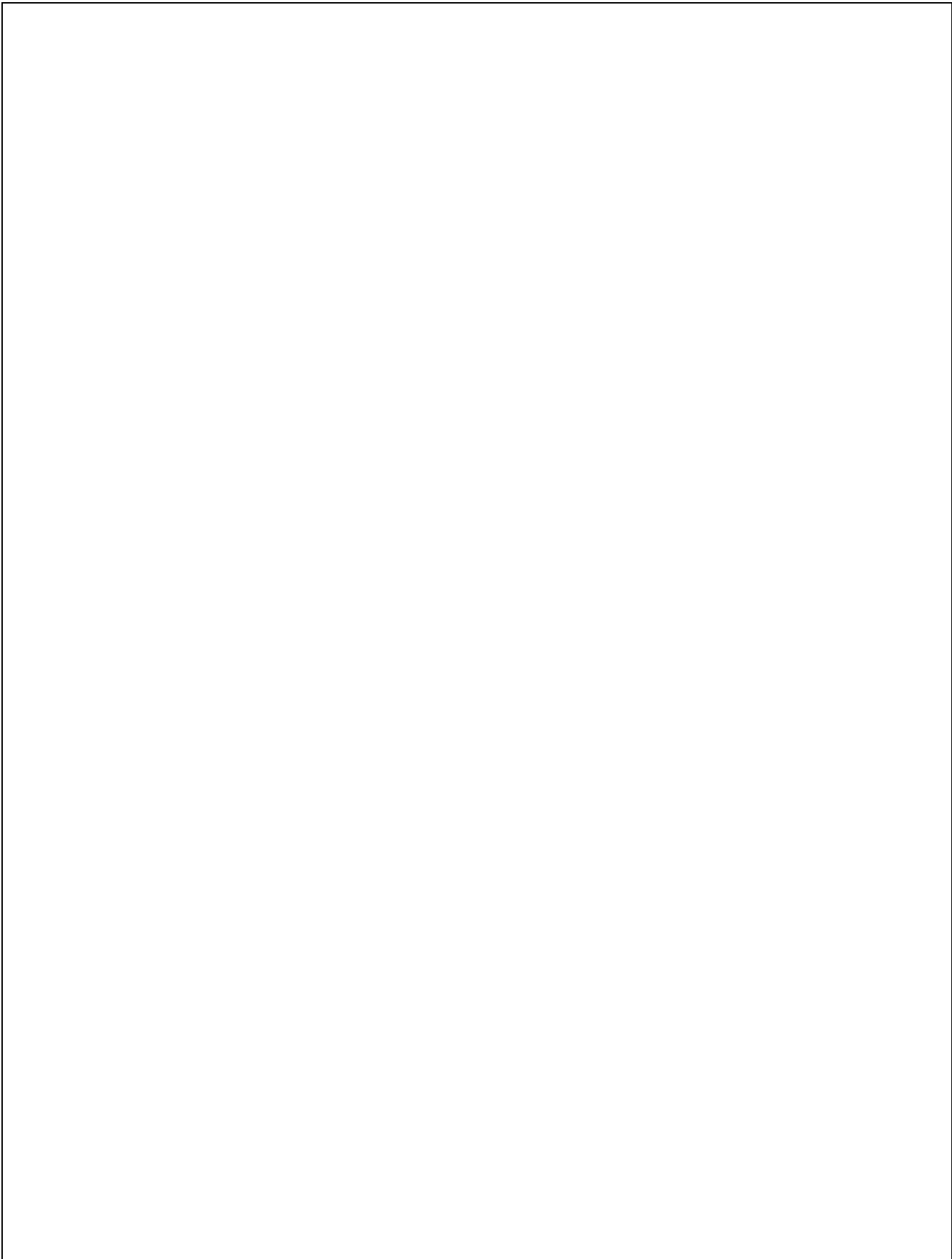
a) $U(x, y) = xy^2$, $MU_x = y^2$, $MU_y = 2xy$

b) $U(x, y) = x^2y$, $MU_x = 2xy$, $MU_y = x^2$

c) $U(x, y) = xy$, $MU_x = y$, $MU_y = x$

Hint:

- 1) Once again, you have to compare the slopes of IC and BL.
- 2) The slope of BL is $-(1+r)$, and the slope of IC is $-MRS$.
- 3) You should borrow when $MU_x/MU_y > 1+r$.
- 4) Also note from the question that his $x = 1000$ and $y = 1050$.



19. (**Voucher and Cash Subsidy**) Samantha purchases food (F) and other goods (Y) with the utility function $U = FY$, with $MU_F = Y$ and $MU_Y = F$. Her income is 12. The price of a food is 2 and the price of other goods 1.

- a) How many units of food does she consume when she maximizes utility?
- b) The government has recently completed a study suggesting that, for a healthy diet, every consumer should consume at least $F = 8$ units of food. The government is considering giving a consumer like Samantha a cash subsidy that would induce her to buy $F = 8$. How large would the cash subsidy need to be? Show her optimal basket with the cash subsidy on an optimal choice diagram with F on the horizontal axis and Y on the vertical axis.
- c) As an alternative to the cash subsidy in part (b), the government is also considering giving consumers like Samantha food stamps, that is, vouchers with a cash value that can only be redeemed to purchase food. Verify that if the government gives her vouchers worth \$16, she will choose $F = 8$. Illustrate her optimal choice on an optimal choice diagram. (You may use the same graph you drew in part (b).)

Hint for Questions b and c:

- 1) You should use the optimality condition ($MU_x/MU_y = P_x/P_y$) together with the BL: $P_xX + P_yY = I$. However, you want $F = 8$, which can be achieved by giving the subsidy of S, so the new BL becomes $P_xX + P_yY = I + S$. Use this to solve for S.
- 2) To verify the optimal choice, use the optimality condition.

21. Darrell has a monthly income of \$60. He spends this money making telephone calls home (measured in minutes of calls) and on other goods. His mobile phone company offers him two plans:

- Plan A: pay no monthly fee and make calls for \$0.50 per minute.
- Plan B: Pay a \$20 monthly fee and make calls for \$0.20 per minute.

Graph Darrell's budget constraint under each of the two plans. If Plan A is better for him, what is the set of baskets he may purchase if his behavior is consistent with utility maximization? What baskets might he purchase if Plan B is better for him?

Hint: Your answer can be in terms of "segment" on the BL.

