1

a)

At an interior optimum, the slope of the budget line must equal the slope of the indifference curve. This implies

$$MRS_{x,y} = \frac{MU_x}{MU_y} = \frac{P_x}{P_y}$$

This can be rewritten as

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

which is known as the "bang for the buck" condition. If this condition does not hold at the chosen interior basket, then the consumer can increase total utility by reallocating his spending to purchase more of the good with the higher "bang for the buck" and less of the other good.

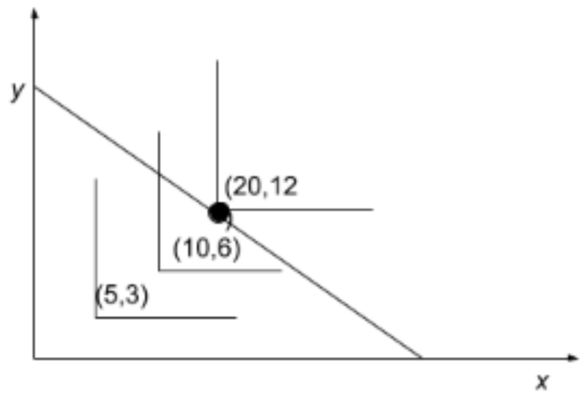
b)

$$\frac{MUx}{Px} < \frac{MUy}{Py}$$ For all bundles x and y in the first quadrant

Given X and Y are positive.

We can see that no matter how many goods X you consume, the ratio of X still less that the ratio of Y. Therefore, we will consume goods Y only.

6



This question cannot be solved using the usual tangency condition. However, you can see from the graph below that the optimum basket will necessarily lie on the "elbow" of some indifference curve, such as (5, 3), (10, 6) etc. If the consumer were at some other point, he could always move to such a point, keeping utility constant and decreasing his expenditure. The equation of all these "elbow" points is $3x = 5y$, or $y = 0.6x$. Therefore the optimum point must be such that $3x = 5y$.

The usual budget constraint must hold of course. That is, $5x + 10y = 220$. Combining these two conditions, we get $(x, y) = (20, 12)$.

7

From the given information we know that $P_H = 3$, $P_M = 1$, and $MRS_{H,M} = 2.$ Comparing the $MRS_{H,M}$ to the price ratio,

$$MRS_{H,M} = 2 < \frac{P_H}{P_M} = \frac{3}{1}$$

Since these are not equal Jane is not currently at an optimum. In addition, we can say that

$$\frac{P_H}{P_M} > MRS_{H,M} = \frac{MU_H}{MU_M}$$

which is equivalent to

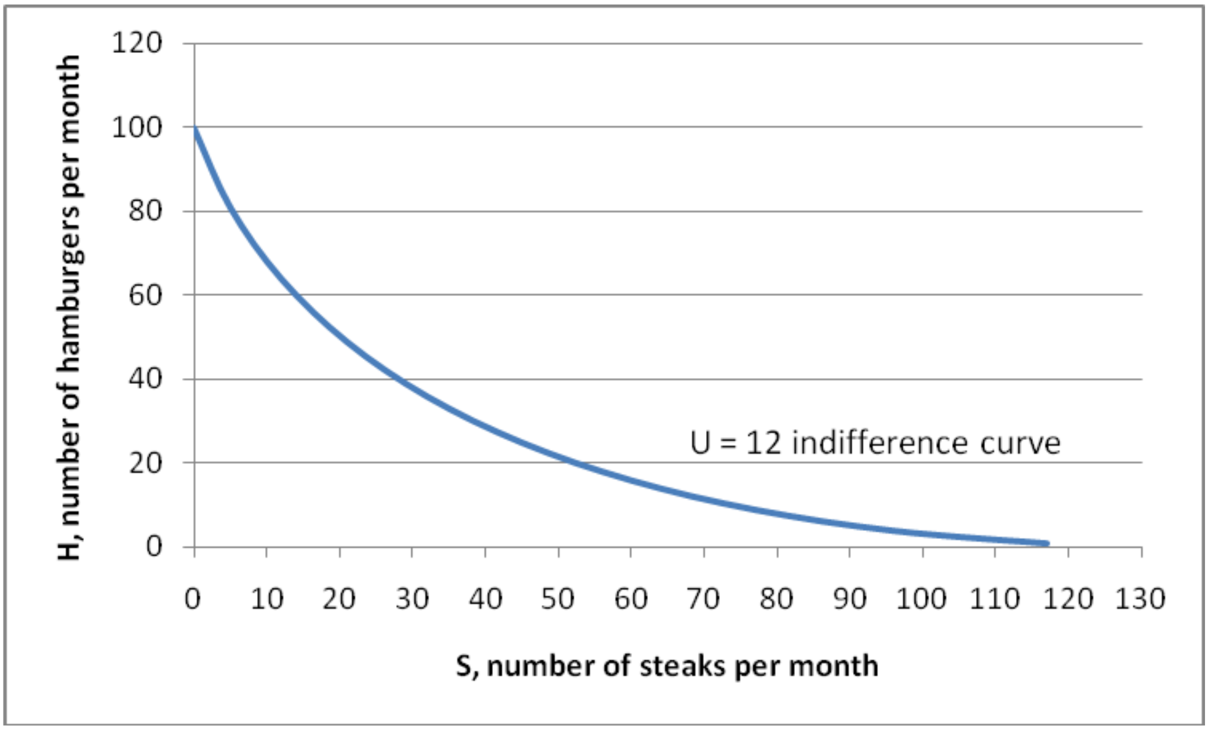
$$\frac{MU_M}{P_M} > \frac{MU_H}{P_H}$$

That is, the "bang for the buck" from milkshakes is greater than the "bang for the buck" from hamburgers. So Jane can increase her total utility by reallocating her spending to purchase fewer hamburgers and more milkshakes.

8

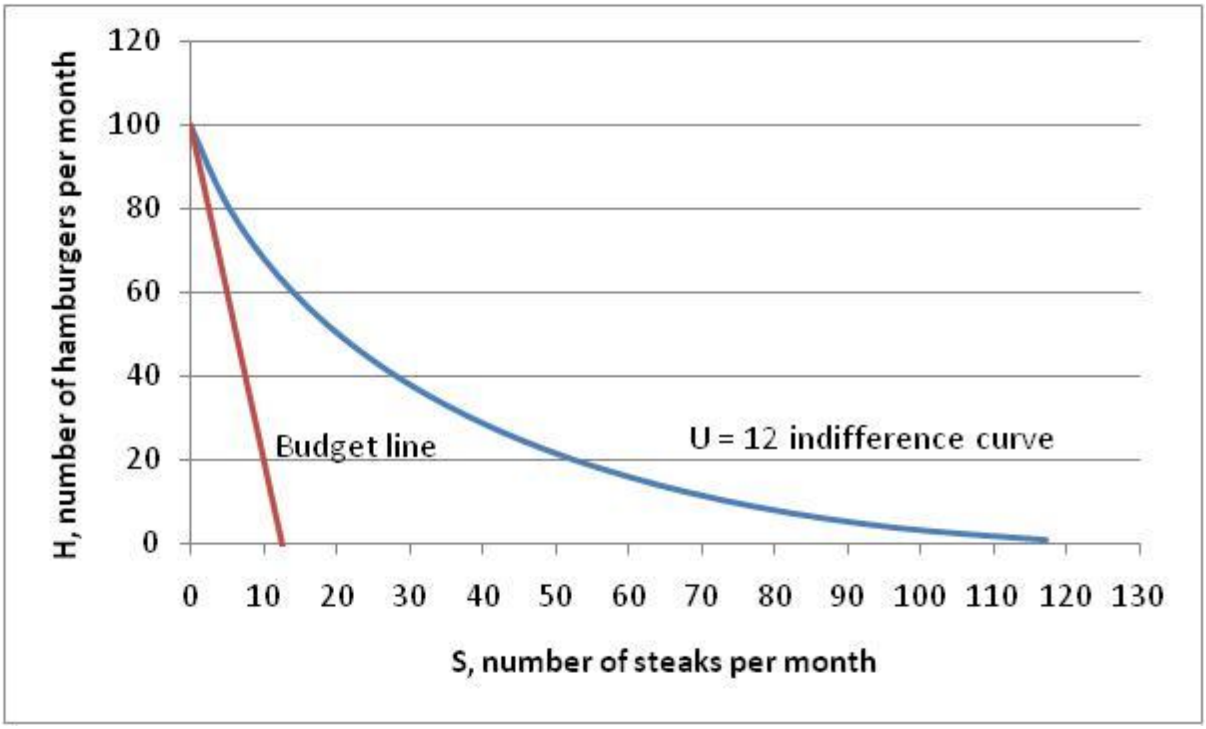
a) Some points on the $U = 12$ indifference curve include

S	*H*	*U*
0	100	12
5	81`	12
12	64	12
21	49	12
32	36	12
45	25	12
60	16	12

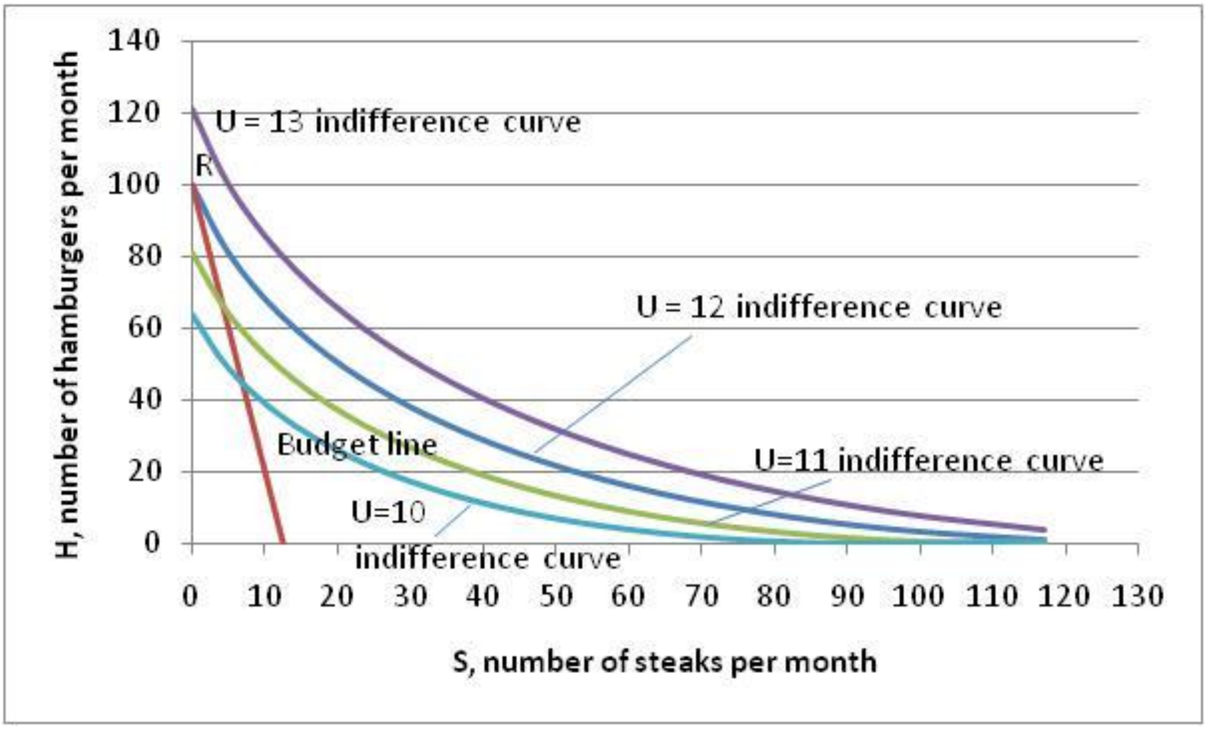


b) The equation of the budget line is $H + 8S = 100$

Graphing this on the same axes as the U = 12 indifference curve gives us:



c) The optimal consumption basket is $S = 0$, $H = 100$, i.e., point *R* in the figure below. There are several ways to see this. One way is to sketch a few more indifference curves (each corresponding to a different level of utility). This picture strongly suggests that the point of maximum utility occurs at point *R*.



Another way is to compare the marginal utility per dollar of spent on hamburger and the marginal utility per dollar spent on steak at point *R*. From the information given in the statement of the problem, $MU_H = \frac{0.5}{\sqrt{H}} MU_H = \frac{0.5}{\sqrt{H}}$ and $MU_S = \frac{0.5}{\sqrt{S+4}}, MU_S = \frac{0.5}{\sqrt{S+4}},$ and so at point R

$$\frac{MU_S}{P_s} = \frac{\frac{0.5}{\sqrt{0+4}}}{8} = \frac{1}{32}$$

$$\frac{MU_H}{P_H} = \frac{\frac{0.5}{\sqrt{100}}}{1} = \frac{1}{20}$$

Thus, at point *R*, the marginal utility per dollar spent on hamburger is greater than the marginal utility per dollar spent on steak, and so the consumer would like to purchase more hamburger and less steak. However, at point *R*, no further reduction in the quantity of steak is possible, and thus *R* is the optimal consumption basket.

10

Since she is willing to trade of 2 units of vanilla for 1 unit of chocolate, so marginal utility of chocolate is 2 times marginal utility of vanilla.

Such that,

$$MRSc, v = 2$$

Therefore, the slope of IC curve is constant (a straight line).

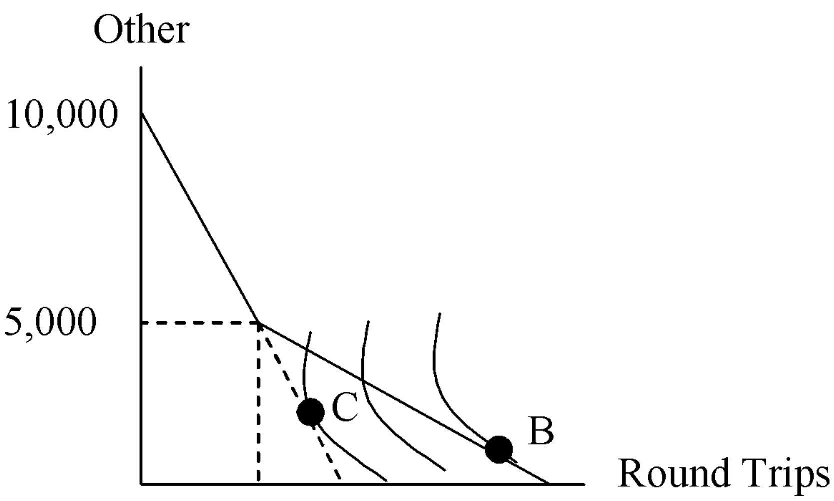
However, the price ratio is $$\frac{Pc}{Pv} = 3$$

$$\frac{MUc}{Pc} < \frac{MUv}{Pv} \quad for\ all\ bundle\ x\ and\ y\ in\ the\ first\ quadrant$$

From question 1b, the solution will be at the corner. Furthermore, the ratio of vanilla is always greater than chocolate's, so she will consume vanilla only.

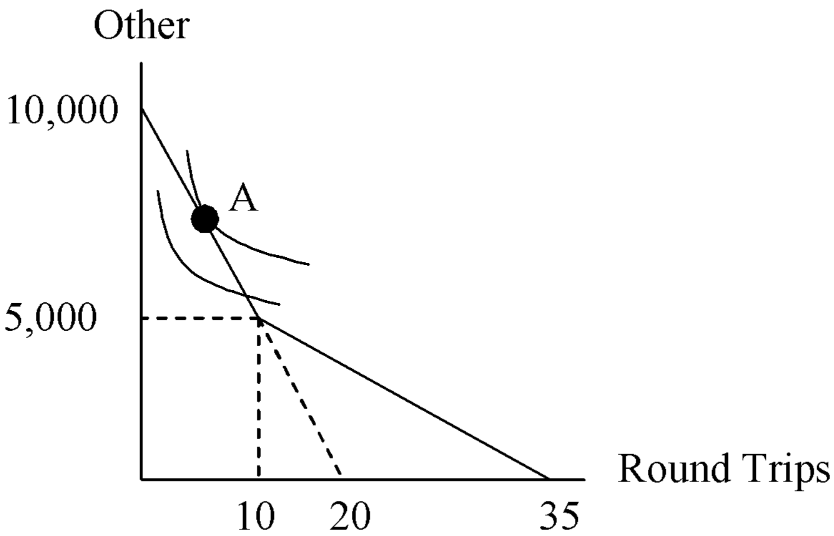
12

a) The budget line will have a kink where round trips = 10 and other goods = 5,000. Northwest of the kink, the budget line's slope will be –500 . Southeast of the kink, the slope will be –200.

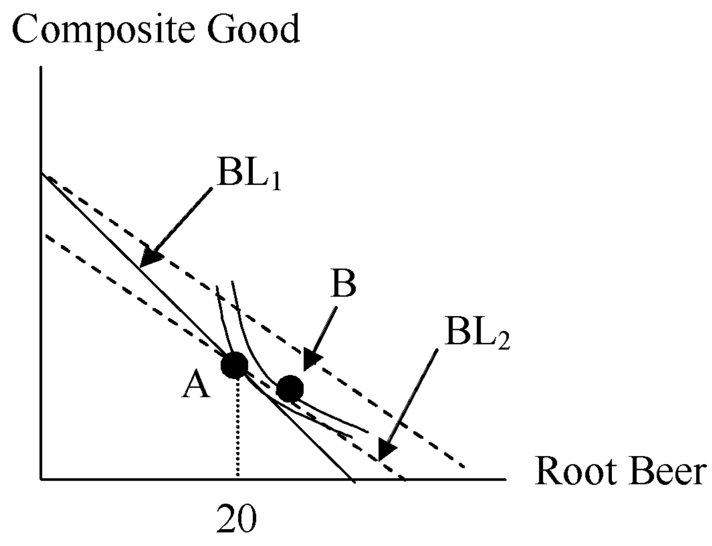


b) With the indifference curves drawn on the above graph, Toni is better off with the frequent flyer program (at point B) than she would be without it (at point C). Without the frequent flyer program, the best she could achieve is point C, which lies on the hypothetical budget line where the price of round trips is always $500.

c) With the indifference curves drawn on graph below, Toni is no better off with the frequent flyer program than she would be without it (at point A). At this point, her indifference curve is tangent to a portion of the budget line where the frequent flyer program does not apply (less than 10 round trips).



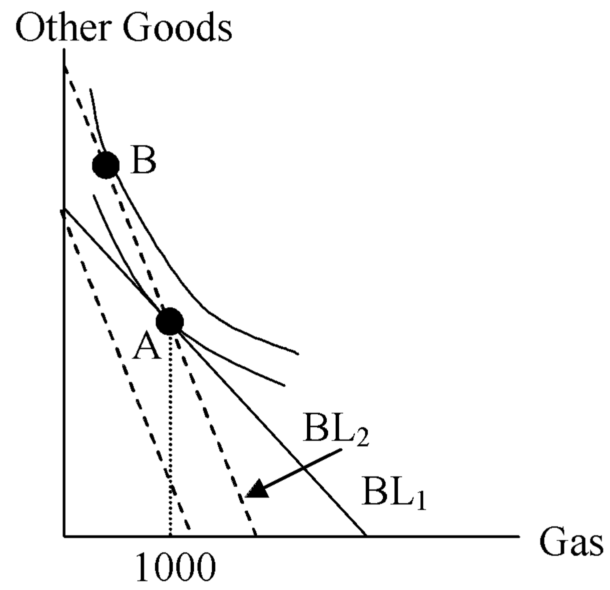
14



Assume the student is initially at an interior optimum, point A. Denote the initial price of root beer by P and the student's income as M. Point A then consists of $R_A = 20$ units of root beer and $Y_A = M - 20P$ units of the composite good. The effect of the proposal is to rotate the budget line outward (the price change) and then shift it inward (the lump sum tax), for a total movement from BL_1 to BL_2. Notice that BL_2 intersects BL_1 exactly at point A: under the proposal, (R_A, Y_A) costs the student $20(P - 0.5) + M - 20P = M - 10$, which is equal to her income under the proposal.

Because A was initially optimal, $MRS_{R,Y} = P$ at point A. Yet the price ratio along BL_2 is $(P - 0.5)$. Hence $MRS_{R,Y} > P_R / P_Y$, so the student can increase her utility by purchasing more root beer and less of the composite good, at a point such as B depicted in the graph above. Thus, the proposal will make the student better off.

15.

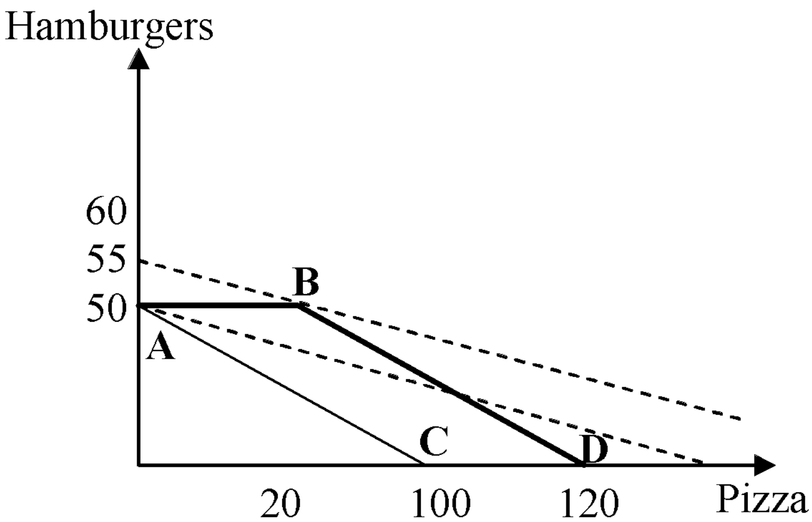


Assume Joe is initially at an interior optimum, point A, and that the price of other goods is \$1. Let Joe's income be M. Point A then consists of $G_A = 1000$ units of root beer and $Y_A = M - 2000$ units of other goods. The effect of the proposal is to rotate the budget line inward (the price change) and then shift it outward (the cash transfer), for a total movement from BL_1 to BL_2. Notice that BL_2 intersects BL_1 exactly at point A: after the price increase, (G_A, Y_A) costs Joe $1000*2.50 + M - 2000 = M + 500$, which is equal to his income after the cash transfer.

Because A was initially optimal, $MRS_{G,Y} = 2$ at point A. Yet the price ratio along BL_2 is 2.5. Hence $MRS_{G,Y} < P_G / P_Y$, so Joe can increase his utility by purchasing less gas and more of the composite good, at a point such as B depicted in the graph above. Thus, the proposal will make Joe better off.

16.

Paul's initial budget constraint is the line AC, allowing him to purchase at most 50 hamburgers or at most 100 pizzas. The $60 cash certificate shifts out his budget constraint without changing the maximum number of hamburgers that he can buy. The new budget constraint is ABD and he can now buy a maximum of 120 pizzas.



Initially, Paul's optimal basket contains all hamburgers and no pizza, at point *A* where (*P, H*) = (0, 50), because $MU_H/P_H = 4/6 > MU_P/P_P = 1/3$. His utility level at point *A* is *U*(0, 50) = 200. When he gets the gift certificate, Paul's optimal basket is at point *B*, spending all of his regular income on hamburgers and the $60 gift certificate on pizza. So point *B* is where (*P, H*) = (20, 50) with a utility of *U*(20, 50) = 220.

However, Paul could also achieve a utility of 220 by consuming 220/4 = 55 hamburgers. To buy the extra 5 hamburgers he would require 5*6 = $30. So, if he had received a cash gift of $30 it would have made Paul exactly as well off as the $60 gift certificate for pizzas.

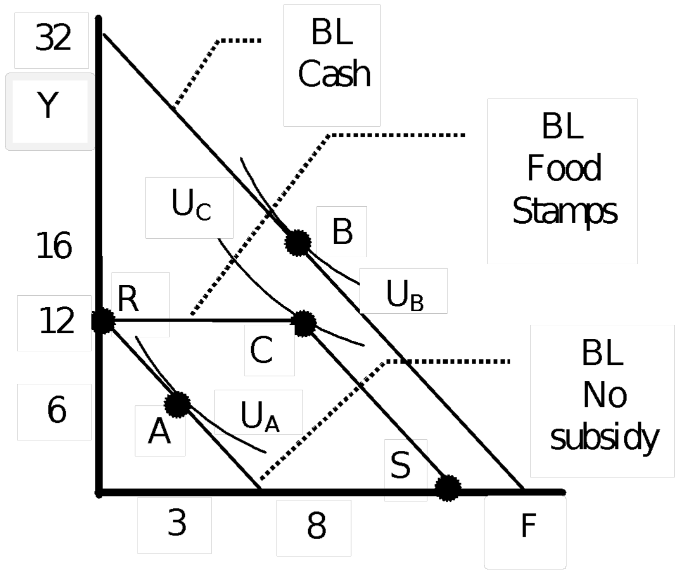
17.

a) In this case, $MRS_{x,y} = \frac{MU_x}{MU_y} = \frac{y}{2x}$. If Jack neither borrows nor lends, then $MRS_{x,y}$= 1050/(2*1000) = 0.525. Recall that if the interest rate is r, the slope of the budget line is –(1+r) = –1.05. Thus, if he neither borrows nor lends it will be the case that $MRS_{x,y_y} < 1 + r$. That is, the "bang for the buck" for spending this month (good x) is less than that for spending next month (good y). Thus, Jack should lend some of his income this month (so $x < 1000$) in order to earn interest and have higher spending next month ($y > 1050$).

b) Now $MRS_{x,y} = 2y/x$. If Jack neither borrows nor lends, $MRS_{x,y}$ = 2.1 > (1 + r). Thus, Jack could increase his utility by borrowing in the first month (so that $x > 1000$ and $y < 1050$).

c) Now $MRS_{x,y} = y/x$. If Jack neither borrows nor lends, $MRS_{x,y}$ = 1.05 = (1 + r). Thus, Jack's utility is maximized when he neither borrows nor lends, simply spending all of his income in each month: (x, y) = (1000, 1050).

19.



a) $MU_Y = F$ and $MU_F = Y$, so $MRS_{F,Y} = Y/F$, which diminishes as F increases along an indifference curve. Since the indifference curves do not intersect either axis, an optimal basket will be interior. At such an optimum two conditions must be satisfied: (1) tangency:$MRS_{F,Y} = P_F / P_Y$, or $Y = 2F$, and (2) budget line ("BL No subsidy" in the graph): 2F + Y = 12. This F = 3 and Y = 6. This optimum is depicted as point A in the graph.

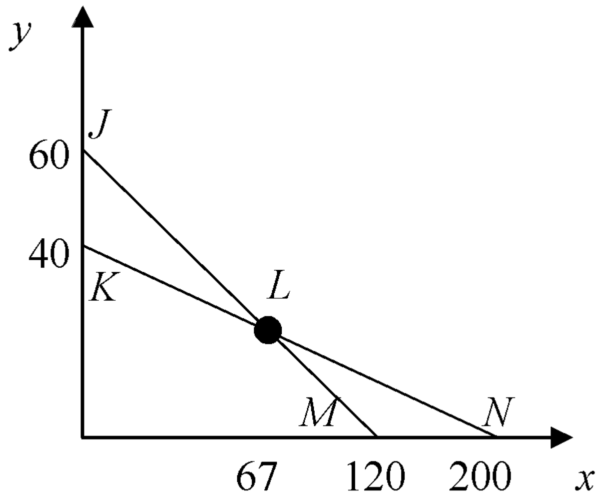
b) We need to find an interior optimum with F = 8. As income increases, the consumer chooses a basket along the Income Consumption Curve, which consists of the tangency points Y = 2F. So Y = 2(8) = 16. Total expenditure will then be 2F + Y = 2(8) + 16 = 32. So the consumer needs an income of 32 ("BL Cash" in the graph). Since the consumer has an income of 12, she needs an additional income of 20 (=32 – 12). So the subsidy needed is 20. This optimum is shown as point B in the graph.

c) From part (b) we see that, with no restrictions on how the government subsidy can be spent, the consumer would like to buy 16 units of Y, more than her own budget (without subsidy) would permit. So we expect that with food stamps, she will use the voucher to purchase the required 8 units of food and spend all of her own unrestricted income (12) on Y. In other words, this consumer will be at point C on the graph, at the kink on the budget constraint RCS (labeled "BL Food Stamps").

We can verify that (F = 8, Y = 12) is her optimal choice by looking at the "bang for the buck" condition at C.$MU_F/Pf = Y/2 = 12/2 = 6$. $MU_Y/Py = F/1 = 8$. So the consumer would like to substitute more Y for F, but cannot do so because at basket C she has purchased all the other goods she can given her budget constraint.

21.

Let *x* denote the number of phone calls, and *y* denote spending on other goods. Under Plan A, Darrell's budget line is *JLM*. Under Plan B, it is *JKLN*. These budget lines intersect at point *L*, or about $x = 67$.



If we know that Darrell chooses Plan A, his optimal bundle must lie on the line segment *JL*. No point between *L* and *M* would be optimal under this plan because then Darrell could have chosen a point under Plan B, between *L* and *N*, that would have given him more minutes, and left him with more money to buy other goods. However, we cannot exclude point *L* itself (Darrell could, for instance, have perfect complements preferences with an "elbow" at point *L*). Thus, if Darrell chooses Plan A his optimal basket could be anywhere between *J* and *L*, including either of these points.

Similarly, if he chose Plan B then his optimal basket must lie between *L* and *N*. Any point between *L* and *K* (but not including point *L*) would be dominated by a point under Plan A between *L* and *J*. Thus, if Darrell chooses Plan B his optimal basket could be anywhere between *L* and *N*, including either of these points.