Homework 2 Answers

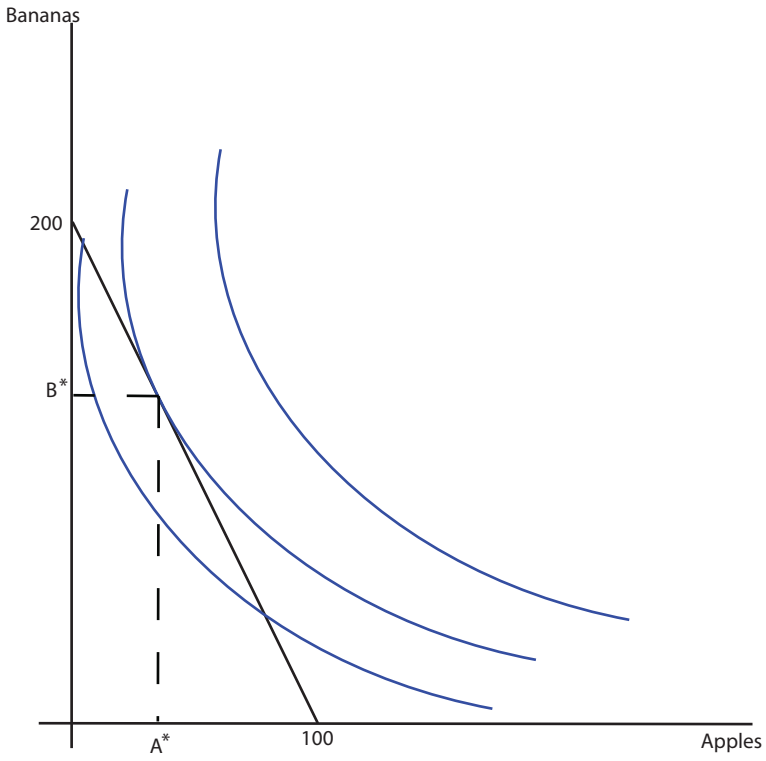
Problem 1 Arthur spends his income on bread and chocolate. He likes chocolate, but is neutral towards bread, in that he doesn't care if he consumes it or not. Sketch Arthur's indifference curve map over bread and chocolate

See page A-29 of your textbook for a picture. The basic idea is that his indifference curves will be horizontal if bread is on the x-axis, and vertical if bread is on the y-axis, as giving him more bread, holding fixed the amount of chocolate he has, leaves him no better off.

Problem 2 Jack has an income of \$100 and spends his money on apples (price \$1) and bananas (price \$.50). His utility function is given by $u(A, B) = \sqrt{AB}$.

a. Sketch Jack's budget line and three of his indifference curves. Make sure to include the indifference curve on which Jack's utility-maximizing bundle lies.

Note that the approximate shape of the indifference curves is what is important. Do not worry too much about getting them exactly right.



b. Suppose that, in a sudden burst of inflation, all prices and incomes in the economy double. Thus, apples now cost \$2, bananas \$1, and Jack now makes \$200. Redraw the picture from part A. Does Jack's new optimal bundle involve more or fewer apples?

As this would not change his budget set at all, the picture from part a and his best affordable bundle would not change.

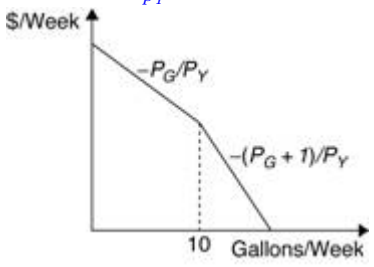
Problem 3 On a diagram with gasoline on the horizontal axis and spending on all other goods on the vertical axis, what happens to the budget line if the government imposes a \$1/gallon tax on gasoline but

does not tax other goods?

Assume other goods (Y) are on the vertical axis and gasoline (G) is on the horizontal axis. If the slope of the budget constraint before the tax is $\frac{p_G}{p_Y}$, after the tax it will become $-\frac{p_G+1}{p_Y}$. Thus a tax increases the price of gasoline and makes the budget constraint become steeper and rotate inwards.

b. What happens to the budget line if the tax applies only to purchases of gasoline in excess of 10 gallons/week.

In the case where tax is applied to consumption of more than 10 gallons per week, the slope of the budget constraint is $-\frac{p_G}{p_Y}$ up to 10 gallons and $-\frac{p_G+1}{p_Y}$ beyond that. This creates a kink in the budget constraint.



Problem 4 Suppose that Boston consumers pay twice as much for avocados as for tangerines, whereas San Diego consumers pay half as much for avocados as for tangerines. Assuming that consumers maximize their utility, which city's consumers have a higher marginal rate of substitution of avocados for tangerines? Explain your answer.

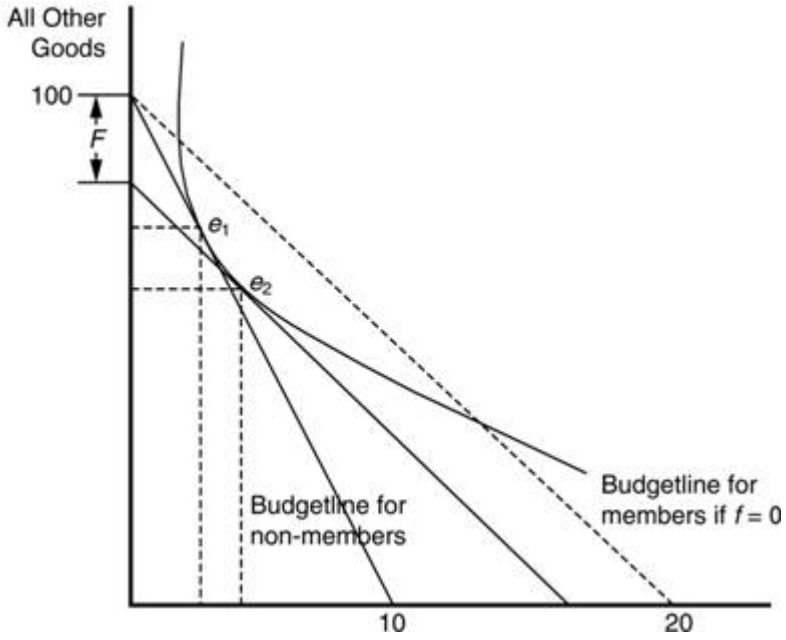
Suppose p_A is the price of avocados and p_T the price of tangerines. We know that at the solution to the consumer choice problem (at the affordable bundle that maximizes utility) the slope of the consumers' indifference curve is qual to $\frac{p_A}{p_T}$. Therefore, in Boston, consumers' indifference curves have slope -2, while in San Diego they have slope .5. This indicates that the value of avocados in terms of tangerines is 2 in Boston while it is 0.5 in San Diego.

Problem 5 The local swimming pool charges nonmembers \$10 per visit. If you join the pool, you can swim for \$5 per visit, but you have to pay an annual fee of \$F.

a. Suppose you have an income of \$100. Draw an indifference curve diagram to graphically determine the value of F such that you are indifferent between joining and not joining. Put number of swimming pool visits on the horizontal axis and dollars spent on all other goods on the vertical axis.

b. Suppose the pool charged you exactly that F. Would you go to the pool more or fewer times as a member than as a nonmember?

Compare e_1 and e_2. We know that you would go to the pool fewer times if you did not purchase the membership.



c. Suppose your utility function is $u(P, X) = P * X$, where P is number of pool visits, and X is dollars spent on all other things. Solve for F mathematically.

This is a harder problem, and you should not worry if you cannot do it. The answer is \$29.29

Problem 6 David's utility function is $u = B + 2Z$. Describe the location of his optimal bundle in terms of the relative prices of B and Z.

See page A-29 of your textbook for an answer. Note that these goods are perfect substitutes, with 2 units of B giving as much utility as 1 unit of Z. Thus his indifference curves are straight lines, and so David's best affordable bundle will be at a corner of his budget set, either with all his money spent on good B or all on good Z. Which is better depends on the prices of these two goods. If he spends all his money on B, he buys quantity $\frac{Y}{p_B}$, giving him utility of $\frac{Y}{p_B}$, while if he buys only good Z, he gets utility $\frac{2Y}{p_Z}$. The former is greater if $p_Z > 2 * p_B$, the latter if $p_Z < 2 * p_B$.

Problem 7 Vasco's utility function is $U = 10X^2Z$. This means $MU_X = 20XZ$ and $MU_Z = 10X^2$. The price of X is \$10, while the price of Z is \$5. Vasco's income is \$150.

a. What is his optimal consumption bundle?

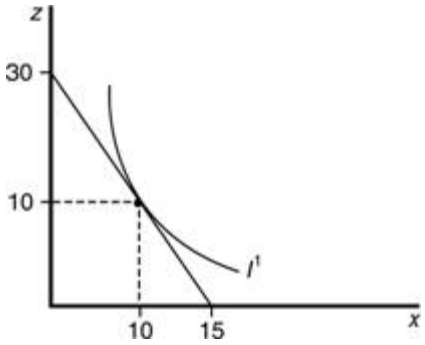
The slope of Vasco's indifference curves is given by $-\frac{MU_X}{MU_Z} = \frac{2Z}{X}$. The slope of his budget line is $-\frac{p_X}{p_Z} = 2$. Thus his utility maximizing bundle is located where the following two equations are satisfied:

$$\frac{2Z}{X} = 2 \tag{1}$$

$$10X + 5Z = 150 \tag{2}$$

which gives us $X^* = 10, Z^* = 10$.

b. Show your answer in a carefully labeled graph.


z
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I¹
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x