Utility Maximization

Problem Set

Use the table below to answer questions 1-2.

Utility								
Units	0	1	2	3	4	5	6	7
Total Utility	0	20	35	45	50	50	45	35

1. The marginal utility for the fifth unit is:
   a. 15.
   b. 10.
   c. 5.
   d. 0.
   e. 50.

2. The law of diminishing marginal utility is first observed at the _____ unit.
   a. second
   b. third
   c. fifth
   d. sixth
   e. first

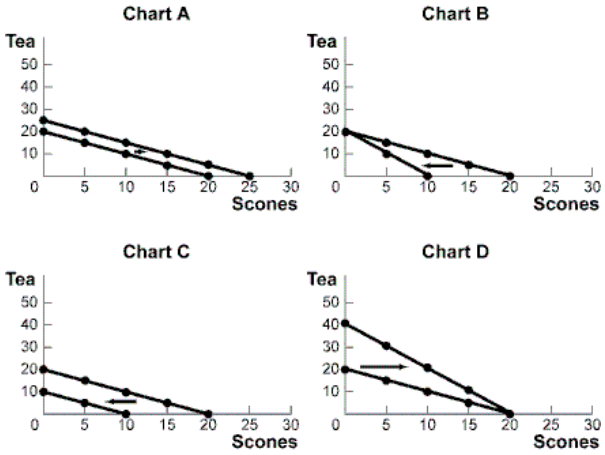
3. Which of the following statements is true?
   a. If total utility is at a maximum, then marginal utility is rising.
   b. If total utility is at a maximum, then marginal utility is at its average value.
   c. If total utility is at a maximum, then marginal utility is at a maximum.
   d. If total utility is at a maximum, then marginal utility is zero.
   e. If total utility is at a maximum, the next unit of consumption will cause marginal utility to equal zero.

Use the table below to answer question 4.

Utility from Oranges and Starfruit			
Pounds of Oranges	Total Utility from Oranges	Pounds of Starfruit	Total Utility from Starfruit
0	0	0	0
1	24	1	70
2	44	2	130
3	60	3	180
4	72	4	220
5	80	5	250
6	84	6	270
7	84	7	280

4. Oranges costs $2 per pound and starfruit cost $5 per pound. The table shows Ned's total utility from eating various amounts of oranges and starfruits. How many pounds of oranges and starfruit should Ned eat, if Ned has $26?
   a. 0 pound of oranges, 5 pounds of starfruit, $1 left over
   b. 8 pounds of oranges and 2 pounds of starfruit
   c. 3 pounds of oranges and 4 pounds of starfruit
   d. 4 pounds of oranges and 5 pounds of starfruit
   e. 3 pounds of oranges and 3 pounds of starfruit

Use the graphs below to answer questions 5-6.



5. For months now, Agnes has had $20 per month to spend on tea and scones. The price of each cup of tea and each scone is $1. Which chart(s) in the figure show(s) what will happen to her budget line if her income increases to $25?
   a. Chart A
   b. Chart B
   c. Chart C
   d. Chart D
   e. Chart A and C

6. For months now, Agnes has had $20 per month to spend on tea and scones. The price of each cup of tea and each scone has been $1. Which chart(s) in the figure show(s) what will happen to her budget line if the price of a cup of tea falls to $0.50?
   a. Chart A
   b. Chart B
   c. Chart C
   d. Chart D
   e. Chart B and D.

7. Chuck spends all his income on two goods: tacos and milkshakes. His income is $100, the price of tacos is $10, and the price of milkshakes is $2. Put tacos on the horizontal axis and milkshakes on the vertical axis. The opportunity cost of one taco equals _____ units of milkshakes.
   a. 2
   b. 10
   c. 5
   d. 1/5
   e. 4

8. Jane spends all her income on Goods X and Y and is purchasing the optimal consumption bundle. If the $MU_X/MU_Y = 3$ and the price of X is equal to $12, then the price of Y is equal to:
   a. $36.
   b. $4.
   c. $12.
   d. $3.
   e. $6

9. Jessica spends all her income on two goods, A and B. The price of A is $5, and the price of B is $7. At the current consumption bundle, the marginal utility of A is 10, and the marginal utility of B is 21. To maximize utility given her income, Jessica should:
   a. increase her consumption of *B* and decrease her consumption of *A*.
   b. increase her consumption of *A* and decrease her consumption of *B*.
   c. continue to consume the current bundle.
   d. consume equal amounts of *A* and *B*.
   e. decrease her consumption of *A* and decrease her consumption of *B*.

10. John Smedley, a careful maximizer of utility, consumes only two goods, peanut butter and broccoli. He had just achieved the utility-maximizing solution in his consumption of the two goods when the price of broccoli rose. As he adjusts to this event, he will consume:
   a. more peanut butter and less broccoli.
   b. less peanut butter and less broccoli.
   c. more peanut butter and more broccoli.
   d. less peanut butter and more broccoli.
   e. less peanut butter and the same amount of broccoli.

11. Jackson spends all his income on baseball cards and candy. At his current consumption bundle, the marginal utility of baseball cards is 20 and the marginal utility of candy is 10. If the price of baseball cards is $10, and the price of candy is $2,
   a. Jackson should increase his consumption of baseball cards and decrease his consumption of candy.
   b. Jackson should increase his consumption of candy and decrease his consumption of baseball cards.
   c. Jackson is maximizing his utility, and he should continue to consume the current bundle.
   d. Jackson should consume equal amounts of baseball cards and candy.
   e. Jackson should increase his consumption of candy and increase his consumption of baseball cards.

Use the table below to answer question 12.

Utility from Burgers and Milkshakes			
Q_{SHAKES}	MU_{SHAKES}	$Q_{BURGERS}$	$MU_{BURGERS}$
0		0	
	36		45
1		1	
	32		40
2		2	
	28		35
3		3	
	24		30
4		4	
	20		25
5		5	
	16		20
6		6	
	12		15
7		7	
	8		10
8		8	

12. David's marginal utilities for milkshakes and burgers are given in the table. The price of milkshakes is $2, and the price of burgers is $5. If David's income is $22, how many milkshakes and how many burgers does he buy to maximize his utility?
   a. 1 shake and 1 burger
   b. 6 shakes and 0 burgers
   c. 5 shakes and 1 burger
   d. 6 shakes and 2 burgers
   e. 1 shake and 4 burgers

13. For each of the following situations, decide whether Al has increasing, constant or diminishing marginal utility.
   a. The more economics classes Al takes, the more he enjoys the subject. And the more classes he takes, the easier each one gets, making him enjoy each additional class more than the one before.

   Al has increasing marginal utility of economics classes. Each additional class adds more to his total utility than the previous class.

   b. Al likes loud music. In fact, according to him, "the louder, the better." Each time he turns the volume up a notch, he adds 5 utils to his total utility.

   Al has constant marginal utility of volume of music. His total utility increases by 5 utils for each additional notch of volume, so his marginal utility is constant at 5 utils.

   c. Al enjoys watching reruns of the old sitcom *Friends*. He claims that these episodes are always funny, but he does admit that the more times he sees an episode, the less funny it gets.

   Al has diminishing marginal utility of *Friends* episodes. Although additional episodes increase his total utility, they do so less and less. That is, his marginal utility declines.

d. Al loves toasted marshmallows. The more he eats, however, the fuller he gets and the less he enjoys each additional marshmallow. And there is a point at which he becomes satiated: beyond that point, more marshmallows actually make him feel worse rather than better.

Al has diminishing marginal utility of marshmallows. For a certain range, additional marshmallows add to his total utility, so total utility increases. But total utility increases by less and less. In fact, total utility eventually begins to decline. In other words, his marginal utility becomes smaller and smaller and eventually becomes negative.

14. Assume that Mary has an income of $130 and that gasoline costs $10 per unit and food costs $20 per unit. Complete the table below and use the information to analyze Mary's choice between gasoline and food.

Marginal utility per dollar spent on gasoline

Quantity of Gasoline	Marginal Utility	Marginal Utility per $
1	60	6.0
2	55	5.5
3	51	5.1
4	48	4.8
5	47	4.7
6	46	4.6

Marginal utility per dollar spent on food

Quantity of Food	Marginal Utility	Marginal Utility per $
1	115	5.75
2	105	5.25
3	98	4.90
4	94	4.70
5	92	4.60
6	90	4.50

If the prices of two goods differ, as they do with gasoline and food, then Mary will adjust his consumption until the marginal utilities per dollar spent are equal. Put another way, the optimal consumption bundle occurs where:

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

a. Does the combination G=1 and F=6 satisfy the income constraint? *Yes*

b. Is this the utility maximizing combination of goods? Why or why not? *No. The marginal utility per dollar spent on gasoline is higher than food so Mary would be better off buying less food and more gasoline.*

c. In which direction would Mary like to reallocate her purchases (i.e., Mary would like to buy more *gasoline* and less *food*)? Why? *The marginal utility of gasoline is higher at this point than food. She would be better off spending her money on more gasoline and less food.*

d. What is Mary's utility maximizing combination of goods, subject to the income constraint of $130? *4 food and 5 gasoline*

15. For each of the following situations, decide whether the bundle Shani is considering is optimal or not. If it is not optimal, how could Shani improve her overall level of utility? That is, determine which good she should spend more on and which good she should spend less on.
    a. Shani has $200 to spend on sneakers and sweaters. Sneakers cost $50 per pair, and sweaters cost $20 each. She is thinking about buying 2 pairs of sneakers and 5 sweaters. She tells her friend that the additional utility she would get from the second pair of sneakers is the same as the additional utility she would get from the fifth sweater.

This bundle lies on Shani's budget line, but the marginal utility per dollar for sneakers and for sweaters is not equal. The marginal utility per pair of sneakers is equal to her marginal utility per sweater. However, since sneakers cost $50 and sweaters cost only $20 (that is, sneakers are 2.5 times as expensive as sweaters), Shani's marginal utility *per dollar* spent on sweaters is 2.5 times greater than her marginal utility *per dollar* spent on sneakers. That is, she would improve her level of utility if she spent more money on sweaters and less on sneakers.

b. Shani has $5 to spend on pens and pencils. Each pen costs $0.50 and each pencil costs $0.10. she is thinking about buying 6 pens and 20 pencils. The last pen would add five times as much to her total utility as the last pencil.

This bundle lies on Shani's budget line. The marginal utility per pen is five times as great as the marginal utility per pencil. However, pens are also five times as expensive as pencils, so her marginal utility per dollar spent on pens is just equal to her marginal utility per dollar spent on pencils. So this is her optimal bundle.

c. Shani has $50 per season to spend on tickets to football games and tickets to soccer games. Each football ticket costs $10, and each soccer ticket costs $5. She is thinking about buying 3 football tickets and 2 soccer tickets. Her marginal utility from the third football ticket is twice as much as her marginal utility from the second soccer ticket.

Although Shani's marginal utility per dollar spent on soccer tickets is equal to her marginal utility per dollar spent on football tickets, this bundle is not optimal: it does not lie on her budget line. She could buy more of both goods and probably will. But for a precise answer about how many football tickets and how many soccer tickets she will actually buy, we would need more information about her utility at other consumption bundles.