

Name: _____

1. (4 points) Suppose that a budget constraint is given by $p_1x_1 + p_2x_2 = m$, and the government imposes a lump-sum tax of u , a ad valorem (a "value" or "sales") tax of t on good 1, and a quantity subsidy of s on good 2. Write out an expression for the new budget constraint:

2. (4 points) If the income of a consumer increases and one of the prices decreases at the same time, will the consumer necessarily be at least as well off after the changes as she was before? Briefly explain.

3. (4 points) Assuming a two-good model, if a consumer's preferences are neutral with respect to good 1, what is its marginal rate of substitution for good 2?

4. (4 points) What kind of preferences are represented by the following utility function?

$$U(x_1, x_2) = \sqrt{x_1 + x_2}$$

5. (10 points) If the price of good y is \$10 per unit and the price of good x is \$4 per unit, and at his current consumption allocation the consumer's marginal rate of substitution is -2, can this consumer increase his utility by purchasing more of good x and less of good y ? Draw a budget line/indifference curve diagram which fully depicts this consumer's situation.

6. (10 points) Suppose a politician, expressing a desire that people make greater use of public transportation services, proposes a tax surcharge (an ad valorem tax) on any automobiles purchased that are the third or greater auto of a household. (In other words, if a household currently owned two vehicles, its purchase of a third vehicle – and all others beyond that number – would be subject to this tax.) Draw a budget diagram that illustrates the effect of this proposal on the feasible consumption set of a household.

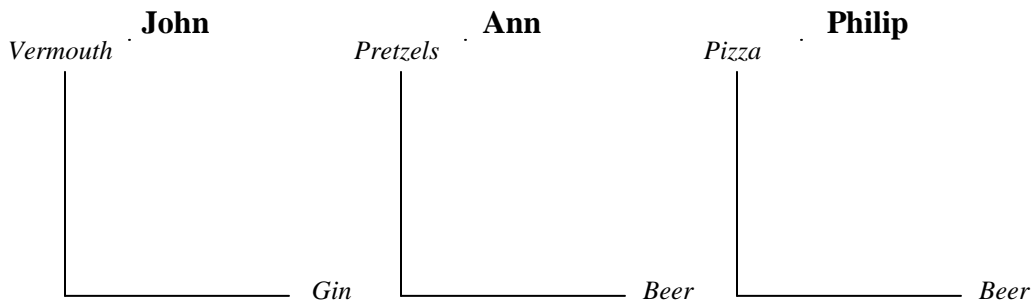
7. (10 points) Write an expression for the marginal rate of substitution for each of the following utility functions, and describe the preferences that these functions exhibit:

a. $U(x_1, x_2) = 6x_1^{1/2} + 5x_2$

b. $U(x_1, x_2) = 2x_1^3 x_2^6$

8. (9 points) On the diagrams below, draw indifference curves for the following people:

- a. John says: "I can't get no satisfaction from 1 ounce of vermouth *or* 3 ounces of gin, but 1 ounce of vermouth *and* 3 ounces of gin together really turns me on."
- b. Ann says: "I enjoy beer and pretzels, but after 12 beers, any additional beer makes me sick."
- c. Philip says: "Exactly 6 beers and 4 slices of pizza is my idea of a perfect meal. Any other combination is just not as good."



**Rose-Hulman Institute of Technology / Department of Humanities & Social Sciences / K. Christ
SL354, Intermediate Microeconomics / Sample Exam #1**

9. (15 points) Each day, Paul, who is in the third grade, eats lunch at school. He only likes to consume twinkies (T) and orange slice (S). His utility function is $U = \sqrt{TS}$.
- a. If twinkies cost \$0.40 each and orange slice costs \$1.00, and Paul's mother gives him \$4.00 per day, how should Paul spend the \$4.00 in order to maximize his utility? Provide a diagram of this solution.
- b. Suppose that the school, in an effort to discourage consumption of twinkies, doubles the price of twinkies to \$0.80. By what amount will Paul's mother have to increase his daily allowance so that Paul may enjoy the same daily consumption bundle at the new prices?
- c. After the price change and the increase in allowance, how should Paul spend his daily allowance in order to maximize his utility? (Assume that he can consume fractional amounts of the goods.) Compare this result to the result in part (a), and modify your diagram appropriately to reflect Paul's new optimum choice point after these changes.

10. (15 points) If a consumer's utility function is $U(x_1, x_2) = x_1 x_2$, derive the demand functions for x_1 and x_2 , showing the following steps:

a. Write out a formal statement of the consumer's constrained maximization problem.

b. Write out the first order conditions of the consumer's constrained maximization problem:

c. Solve for $x_1(p_1, p_2, m)$ and $x_2(p_1, p_2, m)$ -- the demand functions for x_1 and x_2 , respectively:

11. (5 points) Briefly explain what is meant by the term homothetic preferences.

12. (10 points) The tables below report total current consumption expenditures and expenditure on certain major categories of goods for 5 different income groups in the United States in 1961. People within each of these groups all had similar incomes. Group A is the lowest income group, and Group E is the highest income group.

Expenditures by Category for Various Income Groups					
Expenditure Category:	Income Group				
	A	B	C	D	E
Food prepared at home	465	783	1,078	1,382	1,848
Food Away from home	68	171	213	384	872
Housing	626	1,090	1,508	2,043	4,205
Clothing	119	328	508	830	1,745
Transportation	139	519	826	1,222	2,048
Other	364	745	1,039	1,554	3,490
Total Expenditures	1,781	3,636	5,172	7,415	14,208

Allocation of Expenditures (by Percent among Categories for Income Groups)					
Expenditure Category:	Income Group				
	A	B	C	D	E
Food prepared at home	26.0%	22.0%	21.0%	19.0%	13.0%
Food Away from home	3.8%	4.7%	4.1%	5.2%	6.1%
Housing	35.0%	30.0%	29.0%	27.6%	29.6%
Clothing	6.7%	9.0%	9.8%	11.3%	12.3%
Transportation	7.8%	14.0%	16.0%	16.5%	14.4%

Assume that all of these goods are normal goods.

- a. Which of these goods satisfy the textbook definition of a luxury good *at most income levels*? How do you reach this conclusion?
- b. Which of these goods satisfy the textbook definition of a necessity *at most income levels*? How do you reach this conclusion?