ECO 401-002
Spring 2003
1st Test

Name KEY

ID # _____

Multiple choice: 4 pts. each, circle correct answer.

Answer questions 1-3 on the basis of the following information:

Price of X	Quantity of X	Income	Price of Y
$10	5	$20,000	$10
$10	7	$30,000	$10
$10	7	$20,000	$8
$8	7	$20,000	$10

1. The price elasticity of demand for X is
   a) 0.67
   (b) 1.50
   c) 1.00
   d) 1.95

$$\varepsilon_{x,P_x} = \frac{\frac{\Delta Q}{Q_0+Q_1}}{\frac{\Delta P}{P_0+P_1}} = \frac{\frac{2}{12}}{\frac{2}{18}} = 1.5$$

2. The income elasticity of demand for X is
   a) Greater than 1
   (b) Between 0 and 1
   c) Less than 0
   d) 0

$$\varepsilon_{x,I} = \frac{\frac{2}{12}}{\frac{10000}{50000}} = \frac{10}{12} < 1$$

3. The cross-price elasticity of demand is
   a) 0.67
   b) 1.50
   c) -0.67
   (d) -1.50

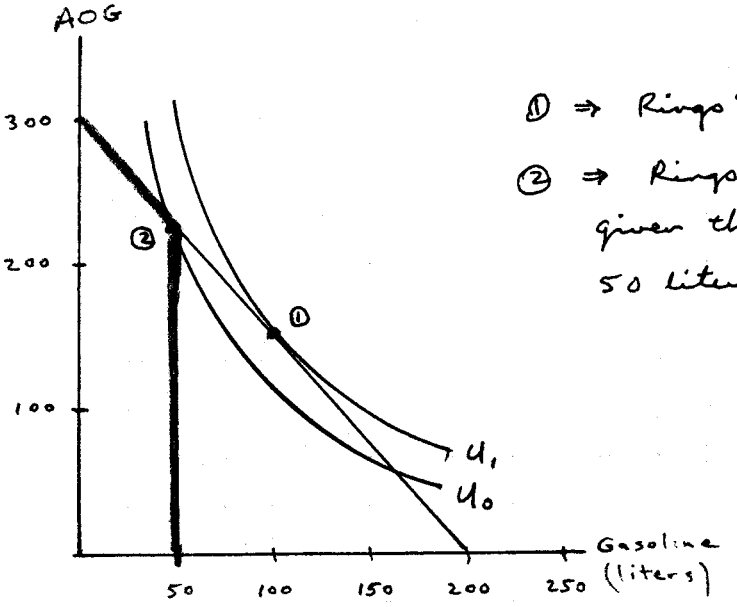
$$\varepsilon_{x,P_y} = \frac{\frac{2}{12}}{-\frac{2}{18}} = -1.5$$

4. If the price-consumption curve for widgets is downward sloping, then we can conclude
   a) Widgets are a luxury good.
   b) Widgets are inferior.
   c) Demand for widgets is inelastic.
   (d) Demand for widgets is elastic.

5. The price of steak is $6 per pound. The price of gasoline is $1.50 per gallon. Your professor is currently consuming steak and gasoline such that the marginal utility of gasoline is 10 utils. Assuming rational behavior, you can conclude that the marginal utility of steak is
   a) 2.5
   b) 10
   (c) 40
   d) 90

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

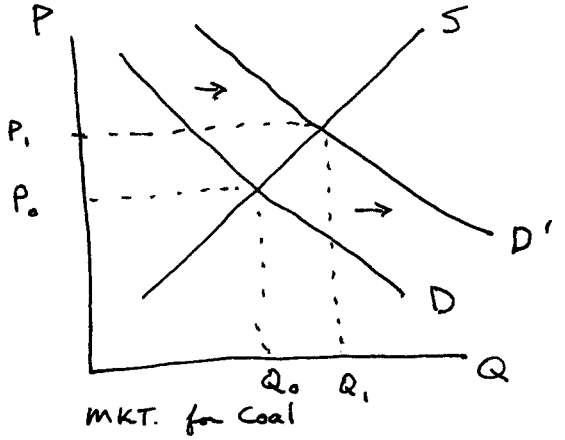
6. (10 pts.) Ringo drives a Rolls Royce that gets very low gas mileage. He would like to purchase 100 liters of gasoline per week at the current price of £1.5 per liter. The £1.5 per liter price, however, is the result of a government-imposed price ceiling, and so Ringo is only able to get 50 liters per week. Draw a budget constraint-indifference curve diagram that is consistent with Ringo's current situation. (Hint: Ringo's weekly income is £300 and he only consumes one other good, AOG, where P_{AOG} = £1.)



① ⇒ Ringo's desired bundle.

② ⇒ Ringo's actual bundle, given that he can only get 50 liters of gasoline per week.

7. (10 pts.) Wholesale electric power is bought and sold in an open and unregulated market. Some producers of electric power use natural gas generating units, others use coal-fired generating units. For a variety of reasons natural gas prices have reached historic levels, rising above $10 per mcf. Using supply and demand analysis, show the effect of higher natural gas prices on the market for coal.



An increase in the price of a substitute good (natural gas) will lead to an increase in the demand for coal. Price of coal will rise and more coal will be bought and sold.

8. (20 pts.) Suppose that you conduct a survey of Kentucky teenagers and find that 30% of 15-19 year olds smoke. There are 290,000 people who are 15-19 years old in the state. The state legislature is considering a tax that would result in an increase in the price of a pack of cigarettes from $2 to $3.
   a) The legislature wants you to estimate how many fewer kids will smoke if they pass the tax. From reviewing economic research on smoking you find that own-price elasticity of demand for cigarettes among teenagers is 0.6.
   b) Suppose that the cigarette tax proposal fails at the state level, but is taken up by Lexington's city council. They propose enacting a local tax that would raise the price of a pack of cigarettes within the borders of Fayette County from $2 to $3. Would you use the same approach that you took in part (a) if city council asked you to estimate the reduction in smoking among teenagers in Fayette County as a result of a local tax?

(a) $30\% \times 290{,}000 = 87{,}000$ 15-19 year olds who currently smoke.

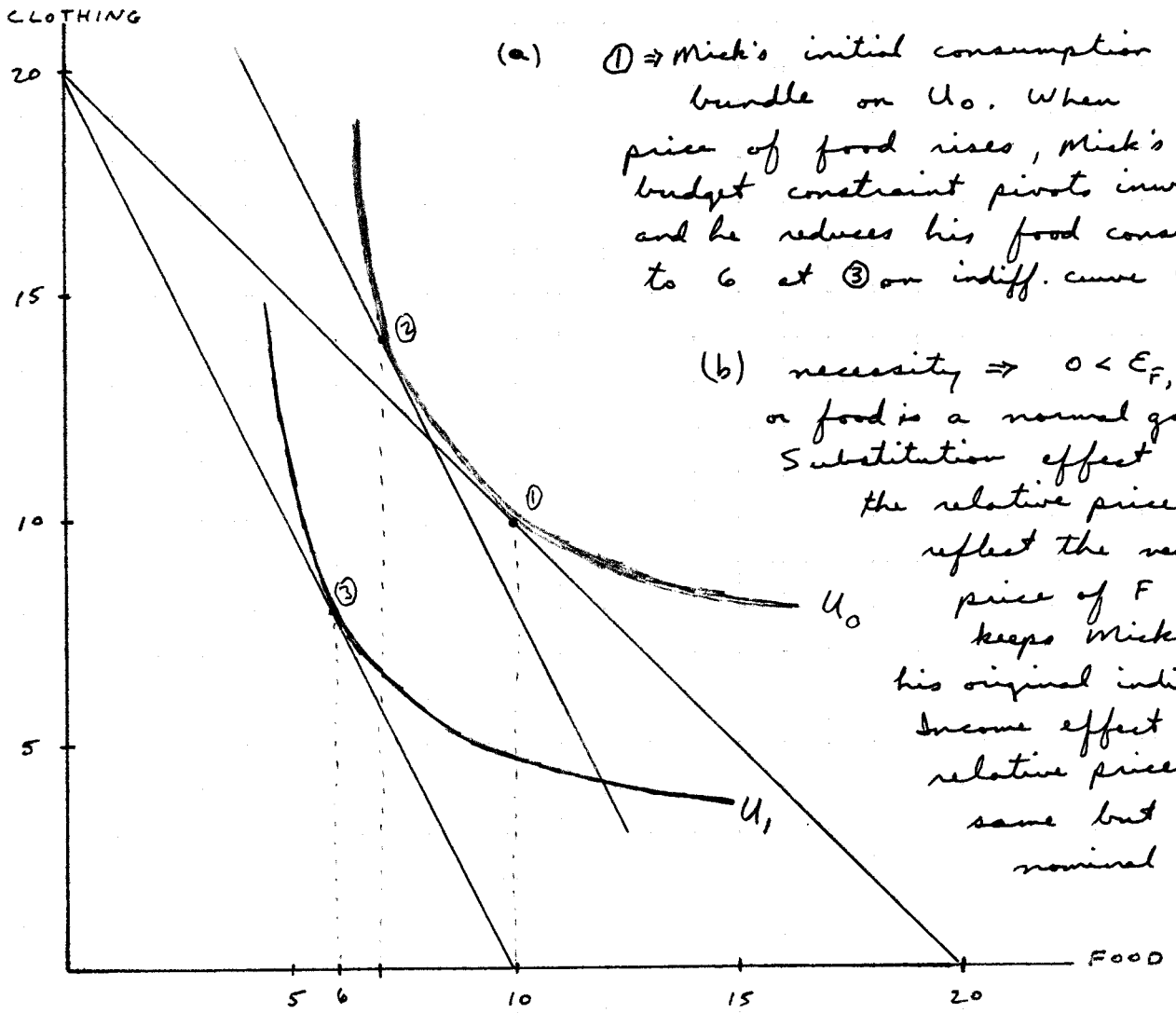
$$\varepsilon_{x,P_x} = \frac{\%\Delta Q}{\%\Delta P}, \quad \%\Delta P \approx 50\% \quad (\$2 \to \$3)$$

$\%\Delta Q = (.6)(50\%) = 30\%$ reduction in Q if P increases by 50%.

$30\% \times 87{,}000 \approx 26{,}100$ fewer smokers among 15-19 year olds.

(b) Problem with above approach: cigarette vendors in Jessamine, Clark, Scott, and Woodford counties will not be subject to the tax. So the estimate of demand elasticity used above, 0.6, does not take into account the ease with which people will be able to avoid the Fayette county tax. The reduction in smoking among teenagers will be much less than 30%.

9. (20 pts.) Mick consumes two goods, food and clothing. Initially Mick has monthly income of \$100, and faces prices P_F = \$5 and P_C = \$5. Under these conditions he chooses the bundle F = 10 and C = 10. Now the price of food rises to \$10 per unit. Mick responds by reducing his food consumption to F = 6.
   a) In the diagram below illustrate Mick's budget constraints and indifference curves that are consistent with this information.
   b) For Mick food is a necessity. With that knowledge, decompose Mick's total change in food consumption when P_F rises into its substitution and income components. Carefully illustrate and explain the substitution effect and the income effect.



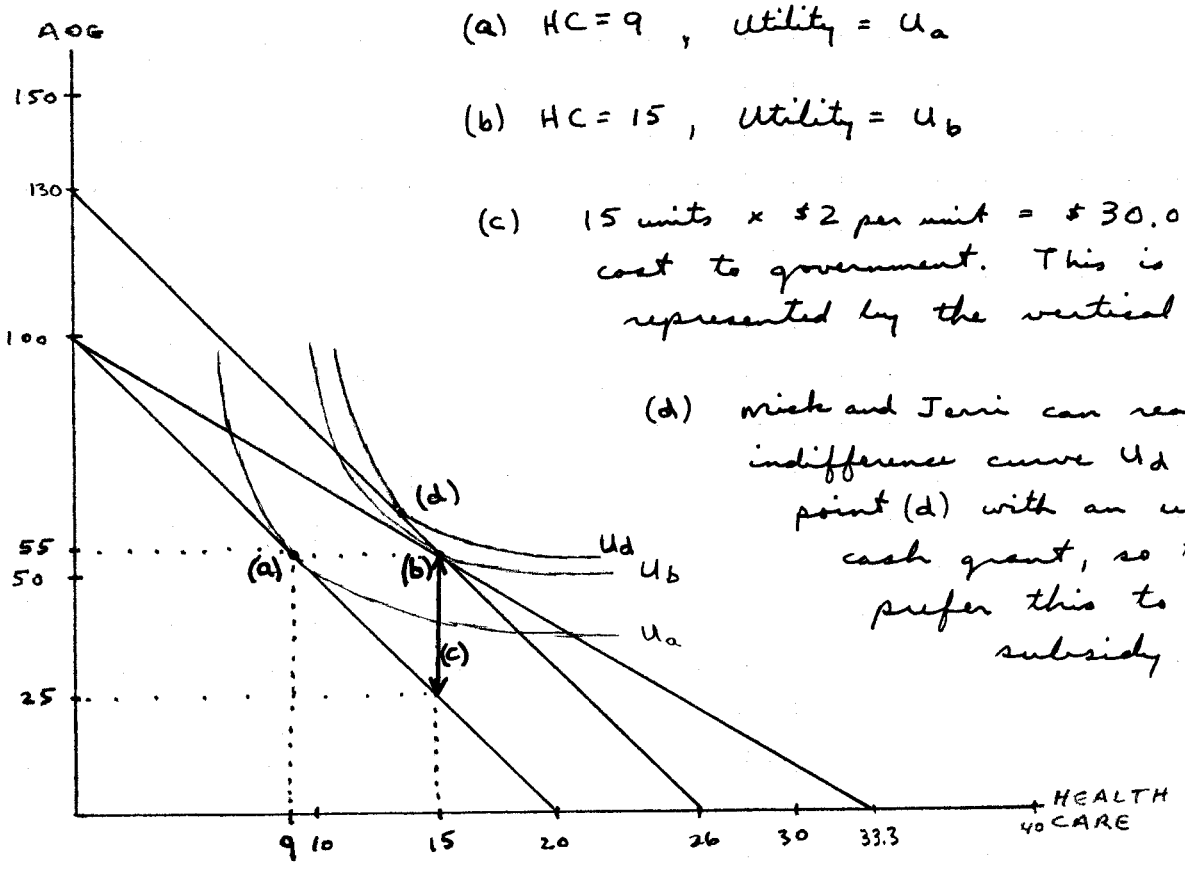
(a) ① ⇒ Mick's initial consumption bundle on U_0. When price of food rises, Mick's budget constraint pivots inward and he reduces his food consumption to 6 at ③ on indiff. curve U_1.

(b) necessity ⇒ $0 < \varepsilon_{F,I} < 1$, or food is a normal good. Substitution effect changes the relative prices to reflect the new higher price of F but keeps Mick on U_0, his original indiff. curve. Income effect keeps relative prices the same but reduces nominal income.

I S
Total

Substitution effect: ① → ②
Income effect: ② → ③
Total Effect: ① → ③

10. (20 pts.) Mick falls in love with Jerri, and they marry and have kids, hoping to live happily ever after. Mick and Jerri's household income is still $100 per month, and now let's imagine that they consume a composite good, AOG, and health care, HC. The per unit price of AOG is $1, and the per unit price of HC is $5. Under these conditions they consume 9 units of HC each month.
    a) Illustrate this initial situation with an indifference curve and budget constraint in the diagram below.
    b) Now Parliament passes a health care act that subsidizes the purchase of health care by low-income households. The subsidy lowers the price to qualifying households from $5 to $3, with government paying the other $2 per unit consumed. Mick and Jerri increase their consumption to 15 units of HC per month. Illustrate with a new indifference curve and budget constraint.
    c) How much will this program cost taxpayers to assist a family like Mick and Jerri? Show how that dollar amount can be represented in your diagram.
    d) Suppose that instead of subsidizing the price of health care, the government decides to give them the equivalent dollar amount as an unrestricted cash grant. In other words, they get a monthly lump-sum transfer equal to the amount you calculated in (c). Will Mick and Jerri prefer this program to the original subsidy approach? Briefly explain.



(a) HC = 9, utility = U_a

(b) HC = 15, utility = U_b

(c) 15 units × $2 per unit = $30.00 cost to government. This is represented by the vertical distance: (b) ↕ (c)

(d) Mick and Jerri can reach indifference curve U_d at point (d) with an unrestricted cash grant, so they will prefer this to the subsidy program.