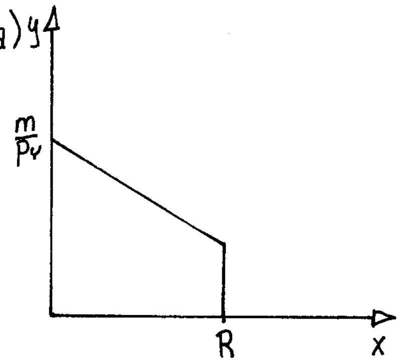
Intermediate Microeconomics (Econ 3101)
Assignment 1

Answers

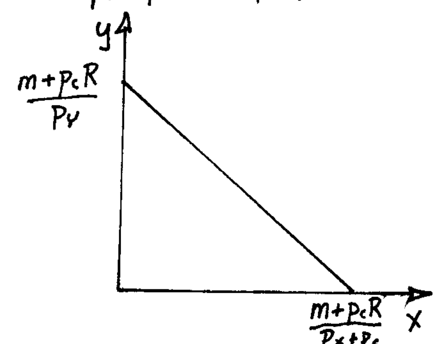
Due **Monday, 22 June 2009, 10:00 am.** Students are welcome to discuss homework in groups, but each student must prepare and submit a unique assignment and note the names of other group members. All assignments must be neat and professional. Answer all parts of all questions.

1. Consider a commodity space with two goods, x and y, with prices p_x and p_y respectively. Suppose a consumer has income m.
(a) Suppose a rationing system prevents consumers from purchasing more than R on good x. Graph the budget set.
(b) Suppose instead that, in addition to their incomes, consumers are issued R coupons. Purchasers of good x must pay p_x and a coupon, but coupon can be traded at price p_c. Graph the budget set and write the budget equation for this situation.

(a)

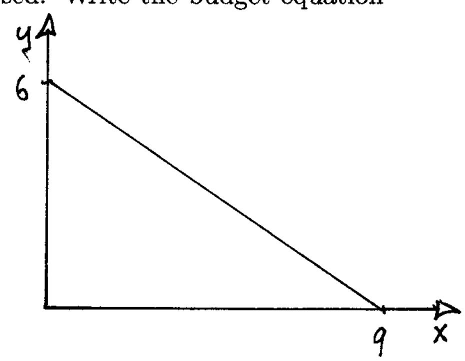


(b) $(p_x+p_c)x + p_y y \leq m + p_c R$

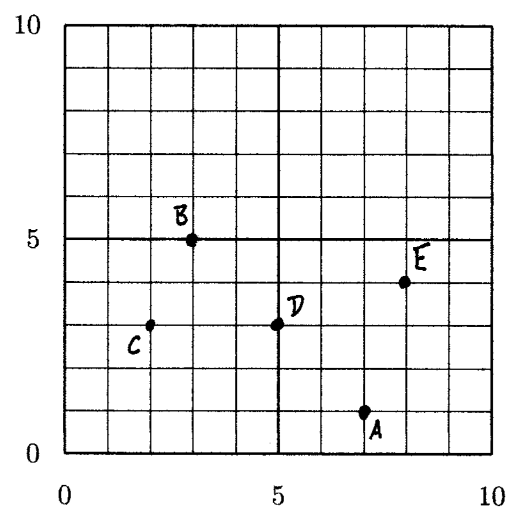


2. Consider again a commodity space with two goods, x and y, with before-tax prices $p_x = 8$ and $p_y = 13$. Suppose a consumer has income of 90. Suppose a 25% ad valorem tax on good x and quantity tax of 2 on good y are imposed. Write the budget equation and graph the budget set.

$$8(1+.25)x + (13+2)y = 90$$
$$10x + 15y = 90$$



3. Suppose a consumer's preferences over two goods satisfy transitivity, continuity, reflexivity, monotonicity, and strict convexity.



(a) Plot and label the following consumption bundles.

A	$(7, 1)$
B	$(3, 5)$
C	$(2, 3)$
D	$(5, 3)$
E	$(8, 4)$

(b) Assume A is indifferent to B. Rank all the bundles from most preferred to least preferred.

$E \succ D \succ A \sim B \succ C$

$B \sim A$ given

$B \succ C$ monotonicity

$D \succ A$ strict convexity

$E \succ D$ monotonicity

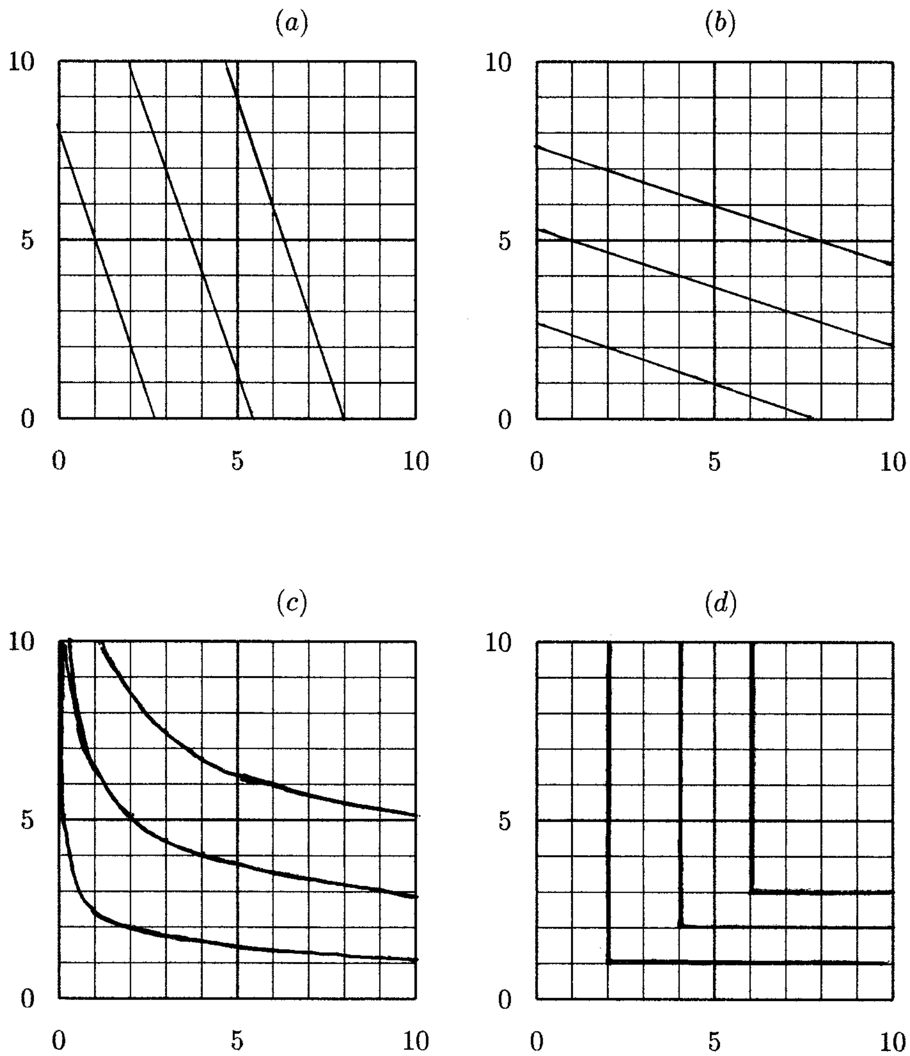
4. For each utility function, draw each consumer's indifferent curves through (2,2), (4,4), and (6,6).

(a) $u(x,y) = 3x + y$

(b) $u(x,y) = x + 3y$

(c) $u(x,y) = x^{\frac{1}{4}} y^{\frac{3}{4}}$

(d) $\min(2x, 4y)$



5. Find the Marginal Rate of Substitution between x and y for each of the following utility functions:
(a) $u(x,y) = \alpha x + \beta y$
(b) $u(x,y) = \alpha x + \beta(y-\gamma)^{\frac{1}{2}}$
(c) $u(x,y) = \alpha \ln(x) + \beta \ln(y)$
(d) $u(x,y) = x^{\alpha} y^{\beta}$

$MRS = \frac{-\partial U/\partial x}{\partial U/\partial y}$

(a) $u(x,y) = \alpha x + \beta y$

$\frac{\partial u}{\partial x} = \alpha$ $\quad MRS = -\frac{\alpha}{\beta}$

$\partial u/\partial y = \beta$

(b) $u(x,y) = \alpha x + \beta(y-\gamma)^{1/2}$

$\frac{\partial u}{\partial x} = \alpha$

$\partial u/\partial y = \frac{1}{2}\beta(y-\gamma)^{-1/2}$

$MRS = -\frac{2\alpha}{\beta}(y-\gamma)^{1/2}$

(c) $u(x,y) = \alpha \ln x + \beta \ln y$

$\frac{\partial u}{\partial x} = \frac{\alpha}{x} \quad \frac{\partial u}{\partial y} = \frac{\beta}{y} \quad MRS = \frac{-\alpha y}{\beta x}$

(d) $u(x,y) = x^{\alpha} y^{\beta}$

$\frac{\partial u}{\partial x} = \alpha x^{\alpha-1} y^{\beta}$

$\frac{\partial u}{\partial y} = \beta x^{\alpha} y^{\beta-1}$

$MRS = \frac{-\alpha x^{\alpha-1} y^{\beta}}{\beta x^{\alpha} y^{\beta-1}}$

$MRS = -\frac{\alpha y}{\beta x}$

6. Suppose a consumer has preferences represented by $u(x,y,z) = 2x^2 + y^2 + z^2$.
(a) Rank the following consumption bundles from most preferred to least preferred: (5,3,3), (3,5,4), (4,4,4), (1,7,2), (6,2,1).
(b) Find the value of C such that the consumer is indifferent between (1,7,2) and (C,2,1).

(a) most preferred (6,2,1) $u(6,2,1) = 77$
(5,3,3) $u(5,3,3) = 68$
(4,4,4) $u(4,4,4) = 64$
(3,5,4) $u(3,5,4) = 59$
least preferred (1,7,2) $u(1,7,2) = 55$

(b) $u(1,7,2) = u(C,2,1)$

$2(1^2) + 7^2 + 2^2 = 2C^2 + 2^2 + 1^2$

$55 = 2C^2 + 5$

$C = 5$

7. Consider a consumer with income 100 and preferences represented by $u(x,y) = x^{\frac{1}{3}} y^{\frac{2}{3}}$. Suppose prices are $p_x = 10$ and $p_y = 8$.
(a) What is the consumer's expenditure on good x?
(b) Derive the demand function for x.

Consumer's problem will have an interior solution, so $-\frac{\partial U/\partial x}{\partial U/\partial y} = -\frac{p_x}{p_y}$

$\frac{\partial U}{\partial x} = \frac{1}{3} x^{-\frac{2}{3}} y^{\frac{2}{3}}, \quad \frac{\partial U}{\partial y} = \frac{2}{3} x^{1/3} y^{-1/3} \Rightarrow \frac{y}{2x} = \frac{p_x}{p_y} \Rightarrow 2p_x x = p_y y$

From budget equation $p_x x + p_y y = m$

$\Rightarrow p_x x = m/3$

(a) Expenditure $p_x x = \frac{m}{3} = \frac{100}{3} \approx 33.3$

(b) Demand $x = \frac{m}{3p_x}$ (here $x = \frac{100}{3 \cdot 10} \approx 3.33$)