Econ3101 - Section 006
Intermediate Microeconomics

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Due: Wednesday, February 8th, 2012.

Homework 2.

The homework will be due at the beginning of the class. Late homework (within the day) will receive partial credit. Very late homework will receive no credit. The maximum score is 100 points. Make sure to do all parts to all problems and do them clearly for full credit.

*Borrowed from Erick Sager with permission.
1. Let’s get some practice plotting the budget constraint. On the graph below, plot the budget constraint when:

(a) (Use Black): \( P_x = 57, \ P_y = 18, \) and \( M = 342. \)
(b) (Use Blue): \( P_x/P_y = 4/5 \) and \( M/P_y = 20. \)
(c) (Use Red): \( M/P_x = 14, \) and \( M/P_y = 16. \)
(d) (Use Pencil): \( P_x/P_y = 4/5, \) and the bundle (19, 16) is on the boundary of feasible set.
2. A consumer’s preferences for goods X and Y are graphed below. Draw the consumer’s demand curve for X when the price of good Y is $P_y = 2$ and the consumer’s income is $M = 30$. (Hint: You should get points that are easy to plot when the price of X is any of these: \{30, 13, 7, 4, 5, 3\}).
3. Consider a consumer who has the utility function \( u(x, y) = \text{min}(3x, 3y) \)

(a) Below, graph some of the consumer’s indifference curves. Graph enough to give a decent feel for the indifference map.

(b) In the lower panel, carefully graph the consumer’s demand curve when her income is \( M=180 \) and the price of good \( y \) is \( P_y = 2 \). Label this curve ”Curve A”. (Hint: Some easy plot points are \{1,2,4,7,10,16\}).

(c) In the lower panel, carefully graph the consumer’s demand curve when her income is \( M=90 \) and the price of good \( y \) is \( P_y = 2 \). Label this curve ”Curve B”. (Hint: Some easy plot points are \{1,2,4,7,16\}).
4. Consider a consumer who has the utility function \( u(x, y) = 32x + 24y \)

(a) Below, graph some of the consumer’s indifference curves. Graph enough to give a decent feel for the indifference map.

(b) In the lower panel, carefully graph the consumer’s demand curve when her income is \( M=2100 \) and the price of good \( y \) is \( P_y = 21 \). Label this curve ”Curve A”.

(c) In the lower panel, carefully graph the consumer’s demand curve when her income is \( M=2100 \) and the price of good \( y \) is \( P_y = \frac{45}{2} \). Label this curve ”Curve B”.
5. Consider a consumer who has the utility function:

\[ u(x, y) = 30x^{\frac{2}{3}}y^{\frac{1}{3}} \]

Notice that the utility function has nice convex, negatively sloping indifference curves with preferences increasing northeasterly. At any point \((x, y)\), the marginal utility of good \(x\) and the marginal utility of good \(y\) are:

\[ MU_x(x, y) = \]

\[ MU_y(x, y) = \]

(a) Suppose the consumer faces positive prices \(p_x > 0\) and \(p_y > 0\), and has limited but positive income, \(M > 0\). Derive the consumer’s demand functions, \(x^* = x(p_x, p_y, M)\) and \(y^* = y(p_x, p_y, M)\). I am asking for you to derive the function that expresses the consumer’s optimal bundle demanded at any level of prices and income. Please show your work!

(b) What fraction \((S_x)\) of her income does the consumer spend on good \(x\)? What fraction \((S_y)\) of her income does the consumer spend on good \(y\)? Does the fraction of her spending on either good depend on the particular prices or income she faces? Briefly discuss your argument.
6. Consider a consumer who has the utility function:

\[ u(x, y) = (15 + x)(15 + y) \]

Notice that the utility function has nice convex, negatively sloping indifference curves with preferences increasing northeasterly. At any point \((x, y)\), the marginal utility of good \(x\) and the marginal utility of good \(y\) are:

\[ MU_x(x, y) = \]

\[ MU_y(x, y) = \]

(a) Suppose the consumer faces positive prices \(p_x > 0\) and \(p_y > 0\), and has limited but positive income, \(M > 0\). Derive the consumer’s demand functions, \(x^* = x(p_x, p_y, M)\) and \(y^* = y(p_x, p_y, M)\). I am asking for you to derive the function that expresses the consumer’s optimal bundle demanded at any level of prices and income. Please show your work!

(b) If the price of good X is 8 dollars, and the price of good Y is 6 dollars, how much of good X will consumer buy when her income is 260 dollars?
7. Consider a consumer who has the utility function:

\[ u(x, y) = \min(30x, 95y) \]

(a) Suppose the consumer faces positive prices \( p_x > 0 \) and \( p_y > 0 \), and has limited but positive income, \( M > 0 \). Derive the consumer’s demand functions, \( x^* = x(p_x, p_y, M) \) and \( y^* = y(p_x, p_y, M) \). I am asking for you to derive the function that expresses the consumer’s optimal bundle demanded at any level of prices and income. Please show your work! (Hint: it might help you to sketch out the indifference map).

(b) If the price of good X is 34 dollars, and the price of good Y is 5 dollars, how much of good X will consumer buy when her income is 43000 dollars?