Econ 335: Labor Economics

Problem set 3, due Monday 9/29/14

1. Utility theory review. There is a lady named Daisy who likes peanut butter and cheese. Daisy's preferences can be represented by the utility function $U(x_1, x_2) = {x_1}^3 {x_2}^2$, where x_1 and x_2 are the quantities of peanut butter and cheese she consumes, respectively. Suppose that Daisy has \$20 to spend, and that the per-unit prices of peanut butter and cheese are $p_1 = 2$ and $p_2 = 4$, respectively.

a) Write an equation for Daisy's budget line, and graph it with x_1 on the horizontal axis and x_2 on the vertical axis. What is the slope of this line?

b) Write an expression for the slope (on the above graph) of Daisy's indifference curve at any given combination of quantities x_1 and x_2.

c) Write an equation indicating that the slope of the budget line and the slope of the indifference curve are the same.

d) Use the equations from (a) and (c) to solve for Daisy's utility-maximizing consumption of peanut butter and cheese. Mark this point on the graph, and sketch the indifference curve that passes through it.

2. Labor supply. Ariel is deciding how much of her time to spend at work. Her preferences over leisure and consumption can be represented by the utility function $U(e, c) = ec$, where e is the share of time she spends not working, and c is her consumption, which relies on her income from work. To be precise, her consumption is given by $c = w(1 - e) + k$, where w is her wage rate, and k is her non-labor income.

a) Ariel's budget line can be re-written as $we + c = w + k$. On a graph that has e on the horizontal axis and c on the vertical axis, what is the slope of this line?

b) Write an expression for the slope of Ariel's indifference curve at any given e, c combination.

c) Write an equation indicating that the slope of the budget line and the slope of the indifference curve are the same.

d) Use the equations from (a) and (c) to solve for Ariel's utility-maximizing combination of leisure and consumption, as functions of her wage w and her non-labor income k.

e) If Ariel's wage is $w = 120$ and her non-labor income is $k = 0$, how much labor and consumption should she choose?

f) If Ariel's wage falls to $w' = 60$ and her non-labor income remains at $k = 0$, how much labor and consumption should she choose?

g) If Ariel's wage is at the lower level of $w' = 60$, find the compensated value of non-labor income k' that makes her original combination of leisure and consumption just barely attainable.

h) If Ariel has the lower wage of $w' = 60$ and the compensated non-labor income k' that you found in part (g), how much labor and consumption should she choose?

i) What are the numerical values of the income effects and substitution effects of the wage change in (f)?

j) Graph the budget lines, optimal points, and indifference curves passing through these points, for the situations described in parts (e), (f), and (g).

3. More labor supply. Nicole's preferences over leisure and consumption can be represented by the utility function $U(e, c) = 50\sqrt{e} + c$. Again, e is the share of time she spends not working, $c = w(1 - e) + k$ is her consumption, w is her wage rate, and k is her non-labor income. *(Caveat: the values of c and k in this problem are a little messy, so I encourage the use of a calculator.)*

a) Find Nicole's optimal combination of leisure and consumption if her wage is $w = 100$ and her non-labor income is $k = 0$.

b) Find Nicole's optimal combination of leisure and consumption if her wage decreases to $w' = 50$ and her non-labor income stays at $k = 0$.

c) Find the value of k' that makes Nicole's original combination of leisure and consumption from part (a) just barely attainable given the lower wage of $w' = 50$.

d) If Nicole has a wage of $w' = 50$ and non-labor income equal to the value of k' that you found in part (c), what is her optimal combination of leisure and consumption?

e) Use the information in parts (a) through (d) to find the numerical values of the income effects and substitution effects of the change in Nicole's wage from $w = 100$ to $w' = 50$.