ECON 301, Prof. Hogendorn

Problem Set 1

1. *MRS.* Let an individual have the utility function

$$U(X, Y) = X^{1/3}Y^{2/3}$$

   (a) Compute the marginal utility of X when X=Y=1.

   (b) Compute the marginal utility of Y when X=Y=1.

   (c) Compute the marginal utility of X when X=5 and Y=9.

   (d) Compute the marginal rate of substitution when X=Y=1.

   (e) Compute the marginal rate of substitution when X=5 and Y=9.

2. *Consistent.* When prices are $p_x = 1, p_y = 2$, a consumer demands $x = 1, y = 2$, and when prices are $p_x = 2, p_y = 1$, the consumer demands $x = 2, y = 1$. Is this behavior consistent with the model of utility maximizing behavior? Draw an indifference curve / budget line diagram to illustrate your answer.

3. *DanBrown.* Amazon sells the bestselling novel *Inferno* in different formats. Rounding the prices to the nearest dollar, the e-book edition on the Amazon Kindle costs $15 and the hardcover print edition costs $18.

   There are two types of consumers, affectionately called Inkies and Pixlees. Each type of consumer has $20 of income that they may allocate between the two types of books. (Don't worry about getting answers with fractional books.)

(a) Write down the budget constraint for buying k units of the Kindle edition (horizontal axis) versus h units of the hardcover edition (vertical axis). Label the vertical and horizontal intercepts.

(b) Find the slope of the budget constraint by using the total differential.

(c) Let Pixlees have utility function:

$$u(k, h) = k^{0.9}h^{0.1}$$

What is a Pixlee's marginal rate of substitution? What is their utility maximizing consumption of k and h?

(d) Inkies have a quasilinear utility:

$$u(k, h) = (k + 1)^{0.5} + h$$

What do their indifference curves look like? Hint: what is the MRS when k=0?

(e) How many books of each type do Inkies buy when they maximize utility?

Review Problem Only, Not to Turn In:

4. *BuyingXandY.* Suppose you have an income of $40 to spend on two commodities. Commodity X costs $10 per unit and commodity Y costs $5 per unit.

(a) Write down your budget constraint. If you spent all your income on X, how much could you buy? If you spent all your income on Y, how much could you buy? Graph your budget constraint. What is its slope?

(b) Suppose the price of X falls to $5 while everything else stays the same. Write down your new budget constraint. What is its slope? Graph your new budget constraint on the same graph as (a).

(c) Suppose your income falls to $30, but the prices of X and Y remain at $5. Write down your new budget constraint. What is its slope? Graph your new budget constraint on the same graph as (a) and (b).

(d) On your graph, shade in the area representing commodity bundles that you can afford with the budget in (c) but could not afford to buy with (a). Shade in the area representing commodity bundles that you could afford with the budget in (a) but cannot afford with the budget in (c).

5. *Jazz.* Suppose that there are two types of jazz music, smooth jazz and traditional jazz. The only jazz radio station in a city plays 10 minutes of smooth jazz for every 10 minutes of traditional jazz. Graph this point (10,10), and then analyze the preferences of the listeners. Assume all listeners have convex preferences, and there are two *equal-sized* groups of listeners, Group 1 and Group 2.

   (a) At the (10,10) point, Group 1 listers have an MRS of 1 minute of traditional jazz per 4 minutes of smooth jazz. Graph the group 1 indifference curve through the (10,10) point.

   (b) At the (10,10) point, Group 2 listers have an MRS of 8 minutes of traditional jazz per 1 minutes of smooth jazz. Graph the group 2 indifference curve through the (10,10) point.

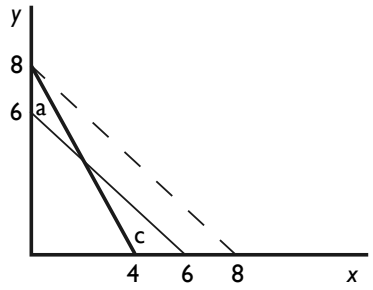
   (c) Suppose the radio station changes its format somewhat and plays 11 minutes of smooth jazz for each 9 minutes of traditional jazz. Which type of listener has moved further in space on the graph from its old indifference curve?

   (d) Can we say which type of listener is better off and which worse off? Can we say whether the gains to one group more than offset the losses to the other? (Be very careful on this last question.)

Answer to Review Problem:

4. *BuyingXandY_a*

   (a) $10X + 5Y = 40$. If you spent all your income on X, you could buy 4. If you spent all your income on Y, you could buy 8. The slope is $-8/4 = -2$. This is represented by the dark budget line in the following graph.



   (b) $5X + 5Y = 40$. $Y = 8 - X$. Slope -1. Dashed line in graph.

   (c) $5X + 5Y = 30$. $Y = 6 - X$. Slope -1. Narrow solid line in graph.

   (d) Can afford area c with budget (c) but not (a). Can afford area a with budget (a) but not (c).

5. *Jazz_a.*

   (a) A nice convex indifference curve.

   (b) The curves cross. Group 2's is steeper.

   (c) If a group had an MRS of -1, then that group would be indifferent to this movement. Both groups have MRSs that differ from -1: group 1's slope is 4 times less and group 2's slope is 8 times more. Thus Group 2's slope differs more and it will therefore move further in space from its old indifference curve (at least using the calculus approximation that is inherent in MRS).

(d) Group 1 is below its old indifference curve and is therefore worse off. Group 2 is above its old indifference curve and therefore better off. We can't compare utility measures between people, so we can't say whether the gains more than offset the losses.