ECON 3104 Exam 1

March 1, 2023

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1. *(20pts.)* *Choice*: Consider a consumer with a utility function $U(x, y) = \sqrt{x} + \sqrt{y}$.

   (a) Find the quantity demanded for both goods if $p_x = 2$, $p_y = 4$, and $m = 40$

2. *(20pts.)* *Perfect Substitutes*: A consumer has a utility function: $U(x, y) = 5x + 3y$

   (a) *5* Graph the indifference curve for the bundle of goods, B: $(x, y) = (6, 5)$

   (b) *5* On the same graph, plot the budget line for $p_x = 2$, $p_y = 4$. and $m = 40$

   (c) *5* Shade in the area of the graph showing bundles the consumer both prefers over B and can afford for $p_x = 2$, $p_y = 4$. and $m = 40$.

   (d) *5* Write the demand functions for both goods as functions of p_x, p_y, and m.

3. *(20pts.)* *Slutsky Equation*: For perfect complements, $U(x, y) = \min(x, y)$, the Walrasian demand functions are $w_y(p_x, p_y, m) = w_x(p_x, p_y, m) = \frac{m}{p_x + p_y}$, and the Hicksian demand functions are $h_y(p_x, p_y, \bar{u}) = h_x(p_x, p_y, \bar{u}) = \bar{u}$

   (a) For these preferences, derive the Slutsky equation for the change in quantity demanded of good x with respect to a change in the price of x. Label the income effect and substitution effect portions.

4. *(40pts.)* *Conceptual questions*

   (a) *10* Explain why the two utility functions, $U_1(x, y) = ln(x) + ln(y)$ and $U_2(x, y) = xy$, represent identical preferences

   (b) *10* Suppose we want to use a quasi-linear utility function to model a consumer's choice between slices of pizza and a composite good representing all other foods: $U(x, y) = ln(x) + y$. Which variable, x or y, should represent slices of pizza? Why?

   (c) *10* Demand for cups of instant ramen, all else equal, is $w_r(p_r, m) = \frac{100}{p_r} - \frac{m}{5}$ for incomes $100 \leq m \leq 500$. Consider only incomes in this range.

      - Is ramen a normal or inferior good? Explain.
      - Does ramen obey the Law of Demand? Explain.

   (d) *10* True or False: MRS is always equal to MRT at a consumer's optimal consumption bundle. If true, briefly explain why; if false, give an example.