

Name \_\_\_\_\_

Midterm Examination: Economics 210A  
November 6, 2013

**Answer Question 1 and any 3 of the remaining 4 questions.  
Good Luck!**

1 ) A consumer has utility function

$$u(x_1, x_2) = \frac{1}{\frac{1}{x_1} + \frac{4}{x_2}}.$$

A) Find this consumer's Marshallian demand function for each good.

B) Find this consumer's indirect utility function.

C) Find this consumer's expenditure function.

D) Find this consumer's Hicksian demand function for each good.

E) Find the income and substitution effects of a change in the price of good 1 on the demand for good 1.

2) A consumer has utility function

$$u(x_1, x_2, x_3) = \frac{1}{\frac{1}{x_1} + \frac{4}{x_2}} + 2\sqrt{x_3}.$$

A) If this consumer has income  $m$  and the prices of the three goods are  $p_1$ ,  $p_2$ , and  $p_3$ , how much of her income will she spend on good 1. (Hint: make use of part B of your answer to the previous question.)

B) Write down the consumer's Marshallian demand function for each good. (Hint: make use of your answer to parts A of this question and the previous question.)

3) Consider the function

$$f(x_1, x_2, x_3) = \ln(x_1^2 + x_2^2 + x_3^2).$$

Explain your answers to each of the following questions:

A) Is the function  $f$  homogeneous? If so, of what degree?

B) Is the function  $f$  homothetic?

C) Find the gradient vector of  $f$  at the point  $(x_1, x_2, x_3) = (1, 3, 5)$ .

D) At the point  $(1, 3, 5)$ , find the directional derivative of  $f$  in the direction  $(2/9, -2/9, 1/9)$ .

4 ) Ada and Bo both have convex preferences defined on a set  $X$ , but their preferences are not identical.

A) Let  $x$  be a commodity bundle in  $X$ . Let  $S$  be the set of bundles that both Ada and Bob like better than  $x$ . Is  $S$  necessarily a convex set? If so, prove it. If not, show a counterexample.

B) Let  $x$  be a commodity bundle in  $X$ . Let  $T$  be the set of bundles such that if  $z \in T$ , then  $z = y_A + y_B$  for some  $y_A \in X$  and  $y_B \in X$ , such that Ada prefers  $y_A$  to  $x$  and Bo prefers  $y_B$  to  $x$ . Is  $T$  necessarily a convex set? If so, prove it. If not, show a counterexample.

5) Will's preferences are represented by the utility function

$$u(x_1, x_2) = \min\{(x_1^{1/2} x_2^{1/2}), x_2\}.$$

A) Draw a couple of indifference curves for Will.

B) Find Will's Marshallian demand functions for goods 1 and 2.