

due : Wednesday October 2    before class (2.30 pm)

Do all 5 questions. Each counts 20%.

1. Are the preferences described below strictly monotonic? Convex? Explain briefly.

The person consumes only bread and cheese. Each kilo of bread contains 500 calories and 50 grams of protein. Each kilo of cheese contains 2000 calories and 100 grams of protein.

The person needs 2000 calories per day, and 50 grams of protein per day, in order to survive. So she is indifferent among all consumption bundles which do not provide enough calories or protein for her to survive.

If two bundles provide enough calories and protein for her to survive, then she prefers (strictly) the bundle with the highest value for  $c + 100p$  where  $c$  is the number of calories provided and  $p$  the number of grams of protein. (If two bundles have the same value for  $c + 100p$ , and if both bundles have at least 2000 calories and at least 50 grams of protein, then she is indifferent between them.)

2. Are the preferences represented by the utility function below strictly monotonic? Convex? Explain briefly.

$$U(x_1, x_2) = 20x_1 + 5x_2 - \frac{10}{x_2}$$

3. Calculate a person's Marshallian demand functions, if her preferences can be represented by the utility function

$$u(x_1, x_2, x_3) = 12 - \frac{1}{x_1} - \frac{1}{\sqrt{x_2 x_3}}$$

4. For what values of income  $y$  and prices  $(p_1, p_2, p_3)$  will a person demand strictly positive quantities of good #1, if her preferences can be represented by the utility function

$$u(x_1, x_2, x_3) = x_1 + \sqrt{x_2 x_3} \quad ?$$

5. Find the expenditure function and the Hicksian demand functions for a person whose direct utility function is

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