Department of Economics  
Microeconomics, Spring 2010  
Problem Set 3: Budget Set, Utility and Consumer choice  
DUE in Class on Feb 10 (Skreta Sections) or Feb 11 (Bowmaker and Collard-Wexler Sections)  
Part I: Short Answer Questions

1. Suppose that Ellen has $I$ to spend on goods $x$ and $y$. The price of good $x$ is $p_x$ and the price of good $y$ is $p_y$. Write down Ellen’s budget line and draw it. Indicate the slope, as well as the vertical and the horizontal intercept.

2. Explain why utility maximization requires that a consumer’s budget is allocated so that the marginal utility per dollar of expenditure is the same for each good.

3. True or false, motivate. Nomis attaches a utility of 10 to microeconomics, whilst Naj attaches a level of 100. Will Naj be happier than Nomis if each of them takes microeconomics?

4. Explain what is meant by a corner solution? Can you give an example?

Part II: Problems  
Problem 1: MRS and Consumer Choice

A Consumer has preferences for apples ($a$) and oranges ($o$) which can be represented by the following utility function:

$$U(a, o) = 5a^{\frac{1}{2}}o^{\frac{1}{2}} - 10$$

The price of apples ($p_a$) is $6 per unit while the price of orange ($p_o$) is $6 per unit, and the consumer has income of $60.

1.1 Compute the $MRS_a$ for o for this consumer if she has (A) four apples ($a = 4$) and six oranges ($o = 6$), (B) six apples ($a = 6$) and four oranges ($o = 4$).
1.2 Given that the prices for apples and the price for oranges, is this consumer maximizing her utility in (A) and (B)? Would you tell the consumer to trade some apples for oranges, stay with the current bundle, or trade oranges for apples in each of these cases?

1.3 Are the preferences represented by this utility function strictly monotonic in either apples or oranges? Give a detailed argument.

1.4 Write down the consumer’s budget constraint.

1.5 Find the bundle of apples and oranges which maximizes the consumer’s utility.

**Problem 2: Optimal Food Choice**

Suppose that a person wants to choose how much proteins $P$, and carbs $C$ to consume to maximize total nutritional value $N(P, C) = P^{3/2}C^{1/2}$ subject to not exceeding 2000 calories. Proteins have 4 calories per unit, while carbs only 3 calories per unit. Find the combination of protein and carb consumption that maximizes nutritional value while respecting the 2000 calorie limit.