ECON 203
Midterm on Consumer Theory

Be sure to show your work for all answers, even if the work is simple.

This exam will begin at 19:40 and end at 21:20

1. *(20 points)* Please read and sign the following statement:

   I promise that my answers to this test are based on my own work without reference to any notes, books, or the assistance of any other person during the test.

   Name and Surname: _
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2. *(15 points)* What three axioms must a person satisfy in order to be considered normatively rational? For each of the three axioms write down a definition (words or mathematics will be fine) and give a counter-example showing that sometimes real people do not have these preferences.

3. *(28 points total)* About Giffen goods:

   (a) *(12 points)* Write down the Slutsky equation in elasticity form. Define each term.

   (b) *(3 points)* Show that if $F = Y^{\tau}$ then $e_F(Y) = \tau$ (where $e_F(Y)$ is the elasticity of F with regards to Y.)

   (c) *(13 points)* Consider the following three curves. For each first find the elasticities with regard to price (p_x) and income (I). (The impact of all other factors is held fixed. They're in the constant.) Second state whether each can be a demand curve. Finally if it can be a demand curve, find how large the share of income spent on that good must be.

      i. $X = 9p_x^{\frac{1}{5}} I^{\frac{3}{11}}$

ii. $X = 12p_x^{\frac{5}{4}} I^{-\frac{1}{4}}$.

iii. $X = 15p_x I^{-5}$

4. *(31 points total)* For the utility function $U(C, F) = -\frac{16}{3C^3} - \frac{1}{3F^3}$.

   (a) *(6 points)* Find the marginal utility of food and clothing and the marginal rate of substitution.

(b) *(6 points)* Which common assumptions about utility functions does this satisfy? You only need to consider $C > 0$ and $F > 0$. (Note: Of course it has to satisfy the axioms required to have a utility function. I will only give credit for other assumptions.)

(c) *(2 points)* Set up the objective function for utility maximization. Let the price of clothing be $p_c > 0$, the price of food be $p_f > 0$ and the income be $I > 0$.

(d) *(3 points)* Find the first order conditions.

(e) *(6 points)* Find the bang for the buck of food and clothing, and a function for F in terms of C and the prices.

(f) *(4 points)* Find the demand curve for C. Simplify if possible.

(g) *(4 points)* Find the demand for F. Simplify if possible.

5. *(6 points)* Write down one of the four great insights of rationality (notice that two of these are called 3a and 3b in the handout). Define the insight and explain it by giving an example.

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      i. $X = 6p_x^2 I^{-4}$

ii. $X = 8p_x^{\frac{5}{3}} I^{-\frac{1}{3}}$.

iii. $X = 15p_x^{\frac{2}{5}} I^{\frac{1}{5}}$

4. *(31 points total)* For the utility function $U(C, F) = -\frac{4}{C^2} - \frac{1}{2F^2}$.

   (a) *(6 points)* Find the marginal utility of food and clothing and the marginal rate of substitution.

(b) *(6 points)* Which common assumptions about utility functions does this satisfy? You only need to consider $C > 0$ and $F > 0$. (Note: Of course it has to satisfy the axioms required to have a utility function. I will only give credit for other assumptions.)

(c) *(2 points)* Set up the objective function for utility maximization. Let the price of clothing be $p_c > 0$, the price of food be $p_f > 0$ and the income be $I > 0$.

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      i. $X = 20p_x^{\frac{1}{2}} I^{\frac{2}{5}}$

ii. $X = 10p_x I^{-3}$.

iii. $X = 15p_x^{\frac{4}{3}} I^{-\frac{1}{3}}$

4. *(31 points total)* For the utility function $U(C, F) = -\frac{1}{3C^3} - \frac{16}{3F^3}$.

   (a) *(6 points)* Find the marginal utility of food and clothing and the marginal rate of substitution.

(b) *(6 points)* Which common assumptions about utility functions does this satisfy? You only need to consider $C > 0$ and $F > 0$. (Note: Of course it has to satisfy the axioms required to have a utility function. I will only give credit for other assumptions.)

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      i. $X = 8p_x I^{-4}$

ii. $X = 3p_x^{\frac{1}{4}} I^{\frac{1}{10}}$.

iii. $X = 4p_x^{\frac{7}{4}} I^{-\frac{1}{4}}$

4. *(31 points total)* For the utility function $U(C, F) = -\frac{1}{2C^2} - \frac{4}{F^2}$.

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