Intermediate Microeconomics
ECNS 301
Fall 2012

Exam #: 3
Version A

Friday December 14, 2012

Name: ____________________________________________

Instructions:
You must answer each of the following 5 questions. Each question is worth the same amount. You have the class period to complete the exam.

Answer each question clearly and concisely. You must show your work to receive credit.

This exam is given under the rules of the Montana State University. By printing your name above you acknowledge the University’s Honor Code and agree to comply with the provisions of the Honor Code. You may not use notes or receive any assistance. There is to be no talking during the exam. You may use a calculator, but are never allowed to use device allowing you to take photographs or transmit over a network. No notes, no assistance, no talking, no cell phones, but you can use a calculator.

Clearly print your name above, in the space provided on the next page and in your blue book(s). You must turn in the exam and your blue book(s). There are two versions of the exam. Indicate your exam version on your blue book. It is your responsibility to make sure your version of the exam is different from the students next to you. If you have the same version as any of the students next to you, you will be asked to move.
Short Answer/Numerical

1. A consumer has the following utility function:

   \[ U(c, y) = c^4 y^2 \]

   where \( c \) is cantaloupe and \( y \) is a composite good.

   (a) What is the marginal rate of substitution?

   (b) What is the demand function for cantaloupes? (Do not assume specific values for prices and income.)

   (c) If income is \( m = 900 \), the price of cantaloupe is \( P_c = 2 \), and the price of the composite good is \( P_y = 1 \), what is the consumer’s optimal consumption bundle?

   (d) You’ve been hired to recommend a policy that would lead consumers to increase the consumption of cantaloupes. Two policies have been proposed: a subsidy to lower the price of cantaloupes, or a cash transfer to increase income.

      i. What subsidized price would lead to a doubling of cantaloupe consumption?

      ii. Considering part i, what cash transfer would lead to the same doubling of cantaloupe consumption?

      iii. Considering parts i and ii, which of the two policies would cost less?

2. There are 105 consumers and each consumer has the following preferences for the goods \( x \) and \( y \)

   \[ u(x, y) = 3x + y \]

   and each consumer has an income level of \( m = 192 \). Firms produce good \( x \) with the following production technology.

   \[ x = K^{\frac{1}{4}} L^{\frac{1}{4}} \]

   Firms produce good \( y \) with the following production technology.

   \[ y = 2K^{\frac{1}{2}} L^{\frac{1}{2}} \]

   \( K \) is the amount of capital used in production which has a rental rate of \( r = 8 \) and \( L \) is the amount of labor used in production with a wage rate of \( w = 2 \). Also, each firm must pay a licensing fee of $72.

   (a) What are the market demand curve for goods \( x \) and \( y \)?

   (b) What are the firm’s cost functions for goods \( x \) and \( y \)?

   (c) If firms are perfectly competitive, what are the market equilibrium prices and quantities for goods \( x \) and \( y \)?

   (d) If firms are perfectly competitive, how many firms produce good \( x \) and how many firms produce good \( y \)?
3. Consider the following strategic form game in Figure 1. The payoffs are listed as the (payoff to the player on the left, payoff to the player on top).

Figure 1: A strategic form game for Question 3

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Player 1</th>
<th>Player 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L</td>
<td>R</td>
</tr>
<tr>
<td>T</td>
<td>(-1,2)</td>
<td>(-1,3)</td>
</tr>
<tr>
<td>B</td>
<td>(-2,-2)</td>
<td>(0,1)</td>
</tr>
</tbody>
</table>

(a) Derive the best response function for each player.
(b) What is the Nash Equilibrium of this game and is it unique?
(c) Use the payoff matrix in Figure 1 to model the extensive form game where Player 1 chooses first.
(d) How does the outcome change if instead of simultaneous decisions, we model an extensive form game where Player 1 chooses first?
(e) Does it make a difference if Player 2 chooses first instead?

4. There are many buyers and one seller. Buyers will only buy one unit if their willingness to pay is above the equilibrium price. The distribution of buyer’s willingness to pay and the seller’s marginal cost is as follows.

<table>
<thead>
<tr>
<th>Buyer’s Willingness to Pay</th>
<th>10 10 9 9 8 7 5 5 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seller’s Marginal Cost</td>
<td>8 7 7 5 5 4 3 3 2 2</td>
</tr>
</tbody>
</table>

(a) Graph the demand curve.
(b) Graph the marginal cost curve.
(c) What is the equilibrium price and quantity?
(d) What is the equilibrium total surplus?
5. The market inverse demand function is $P = 120 - 2Q$. There are two firms: A and B. The costs for firm A are $C(q_A) = 20q_A$ and the costs for firm B are $C(q_B) = 20q_B$. Each firm simultaneously chooses their quantity to maximize profits so we’re considering a Cournot duopoly equilibrium.

(a) Write out Firm A’s profit maximization problem?

(b) What is Firm A’s best response?

(c) What is the market equilibrium price and firm quantities?

(d) What is the market equilibrium consumer surplus?