Intermediate Microeconomics
ECNS 301
Fall 2012

Exam #: 2
Version A

Thursday November 8, 2012

Name: ________________________________

Instructions:
Answer the first question and three of the four questions in the Short Answer/Numerical Section. 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.
True/False/Uncertain Plus Explanation

You must answer the following question.

1. For each of the following, state whether it is true, false or uncertain and explain your answer. No points are given without explanation.

   (a) Technical progress will shift an isoquant outward.

   (b) At low levels of production, marginal productivity of labor increases as labor increases. At high levels of production, marginal productivity of labor decreases as labor increases. These two statements are contradictory.

   (c) The minimum point of a short-run average cost curve will be on the long-run average cost curve. (Hint: this is uncertain, explain why.)

   (d) If the government wishes to increase the utility of consumers by a specific amount, it is less expensive to do that through a cash gift than through a price subsidy on a commonly purchased good (such as food).

Short Answer/Numerical

You must answer three of the following four questions.

2. A firm’s production function is as follows.

   \[ q = KL + 10L \]

   (a) What is the marginal product of labor and the average product of capital?

   (b) What is an equation for any isoquant if \( K \) is on the vertical axis and \( L \) is on the horizontal axis?

   (c) Find the marginal rate of technical substitution as a function of just \( K \) and \( L \).

   (d) Does this production function exhibit increasing returns to scale, constant returns to scale or decreasing returns to scale and why?

3. Consider the following utility function: \( U = x_1^2 x_2 \). The consumer has income of \( M \), the price of \( x_1 \) is \( P_1 \), and the price of \( x_2 \) is \( P_2 \).

   (a) What is the marginal rate of substitution?

   (b) What is the equation for the budget constraint?

   (c) What is the optimal consumption bundle if \( M = 60 \), \( P_1 = 1 \) and \( P_2 = 2 \)? What level of utility is achieved?

   (d) Derive the demand function for good \( x_1 \) with income of \( M \), the price of \( x_1 \) is \( P_1 \), and the price of \( x_2 \) is \( P_2 \) (general, not specific).
4. Consumer’s consume food and other goods. The amount of food consumed is denoted \( f \) with price \( p_f \) and the amount of other goods is denoted \( y \) with price \( p_y \). In order to support farmers (and low income consumers), the state of Montana is considering subsidizing the price of food so that the quantity of food consumed by every consumer is 30. With the price subsidy the price of food becomes \( p'_f = p_f - \tau \) where \( \tau \) is the amount of the per unit subsidy. There are 1 million people in Montana and each person has the following preferences.

\[
U(f, y) = \min\{f, 4y\}
\]

\( p_y \) is normalized to 1, \( p_f = 6 \), income is \( m = 100 \), and the price subsidy considered is \( \tau = 3.75 \).

(a) How does the price subsidy change the optimal consumption bundle of each consumer? What was it before the subsidy and after?

(b) Will the food subsidy achieve its objective?

(c) If instead of a subsidy on the price food, consider an income subsidy which costs the government just as much as the price subsidy did. How much does the income subsidy cost the government and what are the optimal consumption bundles of each consumer with the income subsidy?

(d) What policy should the government implement and what policy is favored by consumers? Why?

5. A firm has the following production function

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

The wage rate and the rental rate of capital are both equal to $1. The firm would like to know the minimum cost of producing 1,000 units of output.

(a) Find the combination of inputs that minimizes the cost of producing 1,000 units.

(b) What is the minimum cost of producing 1,000 units?

(c) Now the firm wants to know how much output it can produce for a cost of $5,000. Find the output-maximizing input combination and the maximum output that can be produced.

(d) The firm decides to purchase 1,000 units of capital. What are the firm’s short run and long run cost curves?