Intermediate Microeconomics
ECNS 301
Spring 2014

Exam #: 2
Version A

Friday March 21, 2014

Name: ________________________________

Instructions:
You must answer all of the following 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.
True/False/Uncertain Plus Explanation

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) A firm operating with diminishing total returns cannot be profit maximizing.
   (b) Cobb-Douglas production functions can never possess varying returns to scale.
   (c) Technical progress will shift an isoquant outward.
   (d) After employing her last laborer, Rachel notices that her Average Product has decreased. Her marginal cost is greater than her Average Variable Cost.

Short Answer/Numerical

2. A firm’s production function is as follows.
   \[ q = KL^2 + 13L + 4 \]
   (a) What is the marginal product of labor and the average product of labor?
   (b) Find the marginal rate of technical substitution as a function of just \( K \) and \( L \).
   (c) Find the value of \( L \) that minimizes the average product of labor.
   (d) At what value of \( K \) does the average product of labor equal the marginal product of labor?
3. Consider the following utility function: \( U = x_1^{\frac{2}{3}} x_2^{\frac{1}{3}} \). 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 \( M = 54 \), \( P_1 = 2 \) and \( P_2 = 3 \)? 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.

\[
U(f, y) = \min\{f, 2y\}
\]

\( p_y \) is normalized to 1, \( p_f = 7 \), income is \( m = 90 \), and the price subsidy considered is \( \tau = 5 \).

(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 it’s objective?

(c) What are the substitution effects and income effects associated with the price subsidy for both \( y \) and \( f \)?

(d) What is the change in consumer welfare due to the price subsidy?