Ag Bus 313
Midterm 2
Section 1
5/23/19
Dr. Hurley

General Instructions: This exam is worth **100 points**. You must provide your own paper. You are allowed one 3x5 note card written on only one-side for the exam. This note card can have anything on it but if it is larger than 3x5 you will get a zero on the exam. You are allowed to use a calculator. You must show all your work when appropriate to get credit. This includes showing all applicable formulas you use. No cell phones, music players (ipods), or PDA's are allowed to be in your possession during the exam. If you are caught with a cell phone, you will receive a zero on the exam.

1. Answer the following questions based on the following production function: $y = f(x) = -x^3+15x^2 - 48x$. Please show how you found your answer. **(20 Points)**

   a. What is the marginal physical product (MPP) function for this production function?

   b. Where is the maximum point on the production function?

   c. Demonstrate that the maximum point that you found for the production function is truly a maximum.

   d. Where does the Law of Diminishing Marginal Returns take effect? (Make sure you provide a number for your answer.)

2. Answer the following questions based on the following production function: $y = f(x_1,x_2) = 70x_1^{1/4}x_2^{1/4}$. Please show how you found your answer. **(20 Points)**

   a. Find the isoquant for any given output level.

   b. If output is equal to 700 and input 1 is equal to 20, how much input 2 do you need?

   c. Calculate the marginal rate of technical substitution (MRTS) in terms of inputs by taking the derivative of the isoquant you found in part b.

   d. Given the information in parts b and c, what is the MRTS? Please explain what this means in an economic sense?

3. Suppose you have 28 acres of land to allocate to corn and soybeans. The production function for corn is $Y_1 = 9x_1^{2/3}$, where Y_1 is the amount of bushels of corn and x_1 is the amount of land used for corn. You also know that the production function for soybeans is $Y_2 = 81x_2^{2/3}$, where Y_2 is the amount of bushels of soybeans and x_2 is the amount of land used for soybeans. **(15 Points)**

a. Please find the production possibility frontier (PPF) using soybeans as the dependent variable and corn as the independent variable?

b. What is the marginal rate of product transformation (MRPT) for the PPF?

c. What is the slope, i.e, MRPT, of the PPF when corn = 9, i.e, $Y_1 = 9$. Please explain what part c means in an economic sense?

4. Answer the following questions based on the following production function: $y = f(x) = -2x^3+12x^2+x$. Also suppose that the input price for x is \$76. Please show how you found your answer. **(15 Points)**

   a. What input gives marginal cost equal to average variable cost?

   b. Assuming that this producer would like to produce at the lowest possible average variable cost while producing a positive output, what level of input and output would this person produce at? Please explain how you found this answer?

   c. What is the average variable cost at your optimal input-output combination?

5. Answer the following questions based on the following production function: $y = f(x) = 60x - x^2$. Assume that the cost of the input is \$40. Please show how you found your answer. **(10 Points)**

   a. Starting from the original production function, derive the cost function as a function of output.

   b. Using the information in part a, what is the marginal cost of the above cost function?

6. Answer the following questions based on the following production function: $y = f(x_1,x_2) = 2x_1^{1/3}x_2^{1/2}$. Also, assume that the price of input 1 is \$20 and the price of input 2 is \$3. Please show how you found your answer. **(20 Points)**

   a. Assuming that this producer is a cost minimizer, what is the person's cost minimization problem.

   b. What are the Lagrangean and the first order conditions for this problem?

   c. Solve part b for the optimal input levels as a function of y.

   d. If you wanted to produce 2,000 units, how much of input 1 and input 2 would you use? What is the minimum cost to produce 2,000 units?