**Ag Bus 313**

**Midterm 1**

**5/9/18**

**Section 1**

**Dr. Hurley**

**General Instructions:** This exam is worth **200 points**. You must provide your own paper. You are allowed one 3x5 note card written on 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 tablets are allowed to be in your possession during the exam. If you are caught with any of these devices, you will receive a zero on the exam. ***Any exam material left visible and unattended, or visible and on the ground will be thrown out by the professor when discovered.***

1. Please classify and explain what each stage of production you are in for each of the given scenarios: **(5 points)**
   1. Average physical product is 635 and the marginal physical product is 473.
2. If your average physical product (APP) is equal to 35 using 4 inputs, what do you expect to happen to your current APP when your marginal physical product (MPP) is 17 when you move to 9 inputs? What is your new APP given this new MPP? Please show how you found your answer. **(15 points)**
3. Given that your total cost is $2,000,000, your total fixed cost is $500,000, and your output is 20,000, what are your a) total variable cost, b) average variable cost, c) average fixed cost, and d) average total cost? Please show how you found your answer. **(5 points)**
4. Please derive AVC = w / APP, using the production and cost relationships. (Hint: define and apply the definition of AVC.) **(5 points)**
5. Explain the intuition of why the optimal output occurs when marginal revenue equals marginal cost. **(5 points)**
6. Solve x2 as a function of x1: **(5 Points)**
   1. 3x1-1/3 x24/3 = 81x18/3 x2-5/3
7. Solve the following for Y2 as a function of Y1: **(5 Points)**
8. Using the three equations, get Y2 as a function of Y1 (Please do not represent your answer in decimals.): **(10 Points)**
9. Y1 = 16x12/3

Y2 = 400x22/3

x1 + x2 = 500

1. Solve for Y1: **(15 Points)**
2. Using limits, find the general slope of the following: **(10 Points)**
3. y = f(x) = 8x2 + 25x + 1,625
4. Please find the derivative of the following functions: **(6 Points)**
5. y = f(x) = (x2 + 5)(4x3 + 2) (Use the Product Rule)
6. y= f(x) = (20x4 + 60x2 + 4x)1/4 (Use either Generalized Power Rule or the Chain Rule)
7. Find the first order and second order (this includes the cross partial derivatives) partial derivatives of the following functions with respect to **x2**: **(9 Points)[[1]](#footnote-1)**
   1. y = f(x1, x2) = 5x11/3 + 100x13/5x23/5 + 160x21/4 +12x1x2 + 75(x1x2)3/5 + 1,611
8. Use the first order conditions to find the critical points of the function. Use the second order conditions to show whether the critical points are maximum, minimum, or saddle points (point of inflection). **(15 Points)**
9. y = f(x) = (16 – x4)2
10. Maximize f(x1,x2) = x11/4x21/3 subject to the constraint 21,000 = g(x1,x2) = 6x1 + 5x2. Solve this problem using the Lagrange Method or by changing it into an unconstrained maximization problem. **(20 Points)**
11. Answer the following questions based on the following production function:

y = f(x) = -9x3+540x2. Please show how you found your answer. **(20 Points)**

* 1. What is the marginal physical product (MPP) function for this production function?
  2. Where is the maximum point on the production function?
  3. Demonstrate that the maximum point that you found for the production function is truly a maximum.
  4. Where does the Law of Diminishing Marginal Returns take effect?

1. Answer the following questions based on the following production function:

y = f(x1,x2) = -4x12 + 48x1 - 7x22 + 140x2. Please show how you found your answer. **(10 Points)**

1. What is the marginal physical product (MPPx1) function for this production function with respect to input 1? What is the marginal physical product (MPPx2) function for this production function with respect to input 2?
2. What is the extrema point to this production function? What is the maximum you can achieve for output?
3. Answer the following questions based on the following production function:

y = f(x1,x2) = 24x11/3x21/4. Please show how you found your answer. **(25 Points)**

1. Find the isoquant for any given output level.
2. If output is equal to 1,080 and input 1 is equal to 27, how much input 2 do you need?
3. Calculate the marginal rate of technical substitution (MRTS) in terms of inputs by taking the derivative of the isoquant you found in part b.
4. Given the information in parts b and c, what is the MRTS? Please explain what this means in an economic sense?
5. What are the returns to scale for this production function?
6. Suppose you have 1,000 acres of land to allocate to corn and soybeans. The production function for corn is Y1 = 9x12/3, where Y1 is the amount of bushels of corn and x1 is the amount of land used for corn. You also know that the production function for soybeans is Y2 = 81x22/3, where Y2 is the amount of bushels of soybeans and x2 is the amount of land used for soybeans. **(15 Points)**
7. Please find the production possibility frontier (PPF) using soybeans as the dependent variable and corn as the independent variable? **(10 Points)**
8. What is the marginal rate of product transformation (MRPT) for the PPF?

1. The cross derivatives for a function f(x1,x2) are [↑](#footnote-ref-1)