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. _**Any exam material left visible and unattended, or visible and on the ground will be thrown out by the professor when discovered.**_

1. Answer the following questions based on the following production function: $y = f(x) = -3x^3 + 81x^2$. Please show how you found your answer. **(10 Points)**

    a. What is the highest achievable MPP?

    b. Where does Stage II of the production function turn into Stage III of the production function? (Please give me an actual number related to the production function.)

2. Answer the following questions based on the following production function: $y = f(x_1, x_2) = -25x_1^2 + 100x_1 - x_2^2 + 30x_2$. Please show how you found your answer. **(10 Points)**

    a. Find the isoquant for any given output level? (Note: make sure you find the one that makes economic sense.) **(10 Points)**

3. Answer the following questions based on the following production function: $y = f(x_1, x_2) = 80x_1^{1/5}x_2^{1/2}$. Please show how you found your answer. **(25 Points)**

    a. Find the isoquant for any given output level.

    b. If output is equal to 6,400 and input 1 is equal to 32, 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 a.

    d. Given the information in parts b and c, what is the MRTS?

    e. Please explain what this means in an economic sense?

Last revised: 11/8/19

4. Suppose you have 65 acres of land to allocate to corn and soybeans. The production function for corn is $Y_1 = 25x_1^{2/3}$, 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 $Y_2 = 25x_2^{2/3}$, where Y_2 is the amount of bushels of soybeans and x_2 is the amount of land used for soybeans. **(20 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 = 400, i.e, $Y_1 = 400$.

   d. Please explain what part c means in an economic sense?

5. Answer the following questions based on the following production function: $y = f(x) = -2x^3 + 200x^2 + 1000x$. Also suppose that the input price for x is \$24,000. 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?

6. Answer the following questions based on the following production function: $y = f(x_1, x_2) = 80x_1^{1/5}x_2^{1/2}$. Also, assume that the price of input 1 is \$200 and the price of input 2 is \$10. 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? Solve this for the optimal input levels as a function of y. **(10 Points)**

   c. If you wanted to produce 6,400 units, how much of input 1 and input 2 would you use? What is the minimum cost to produce 6,400 units?

Last revised: 11/8/19