APEC 5151: Applied Microeconomics: firm and household
Fall 2015 Midterm Exam
October 22, 2015

NAME:

Be sure to answer all parts of each question as several require multiple answers. Please show all steps of your work. Please whenever you use a graph make sure that they are labeled appropriately.

1. (6 points) Suppose the demand function for coffee is $Q = 1 - p_c + 2p_t + 0.1Y$ where Q is the quantity of coffee demanded, p_c and p_t are the prices of coffee and tea per kilogram, respectively, and Y is the average consumer income. What are the own- and cross-price elasticities of demand for coffee at $p_c = 2$, $p_t = 1$ and $Q = 2$. Please interpret your findings.

2. (6 points) If the price of tea increases to 1.5 per kilogram, does the quantity of coffee demanded increase or decrease? By how much?
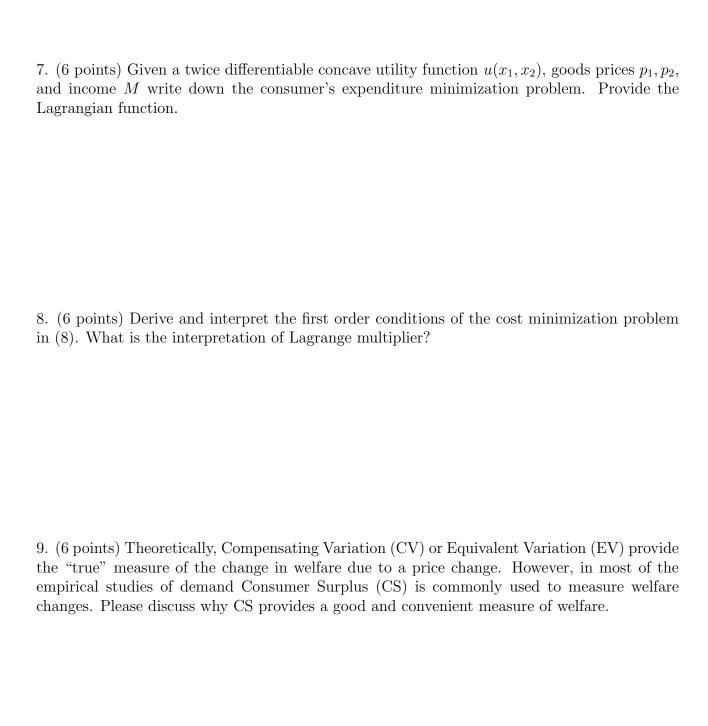
3. (6 points) The slope of the Marshallian demand curve for a normal good is indeterminate. True or False? Please explain.

Use the following information to answer question 4-6. Suppose the uncompensated demand functions for x_1 and x_2 are given as: $x_1 = x_1^*(p_1, p_2, M)$ and $x_2 = x_2^*(p_1, p_2, M)$, where p_i is the price of good i, and M is income. Assume $\underline{x_1 \text{ is inferior}}$ and $\underline{x_2 \text{ is a normal good}}$.

4. (6 points) What is income effect? On a graph, explain the effect of an increase in income on x_1. Please clearly label your graph.

5. (6 points) Suppose that price of x_1 is decreased, denote as p_1. On a graph, explain the effect of a decrease in p_1 on x_1. Please clearly label your graph.

6. (6 points) Suppose that x_1 and x_2 are gross substitutes. On a graph, explain the effect of a decrease in p_1 on x_2. Please clearly label your graph.

7. (6 points) Given a twice differentiable concave utility function $u(x_1, x_2)$, goods prices p_1, p_2, and income M write down the consumer's expenditure minimization problem. Provide the Lagrangian function.

8. (6 points) Derive and interpret the first order conditions of the cost minimization problem in (8). What is the interpretation of Lagrange multiplier?

9. (6 points) Theoretically, Compensating Variation (CV) or Equivalent Variation (EV) provide the "true" measure of the change in welfare due to a price change. However, in most of the empirical studies of demand Consumer Surplus (CS) is commonly used to measure welfare changes. Please discuss why CS provides a good and convenient measure of welfare.

Given below is a two input production function. Use production function 2 to answer questions 10-12.
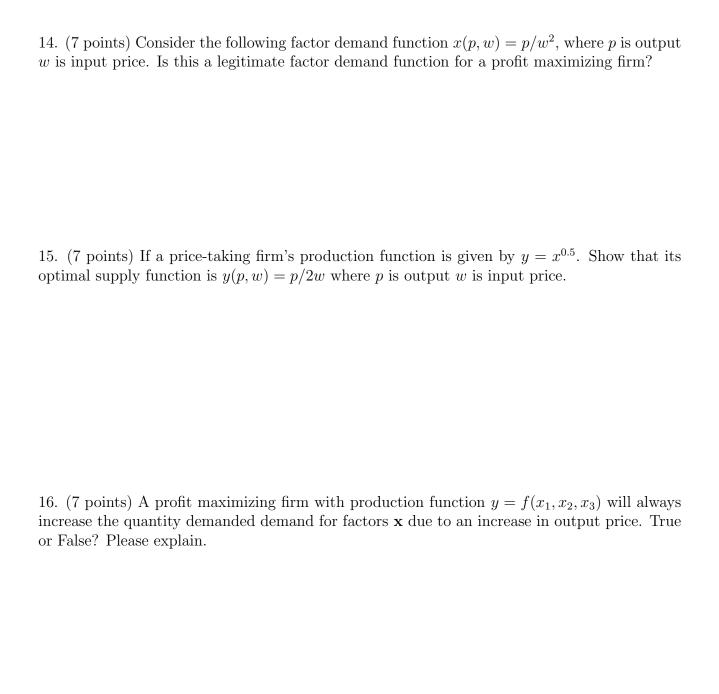
$$y = 5 + 3x_1 + 2x_2 - 0.1x_1^2 - 0.1x_2^2 - 0.1x_1x_2$$

10. (6 points) Is either input in production function 2 essential? Can you characterize the factor interdependency?

11. (6 points) What is the rate of technical substitution between inputs, RTS_{12}? In words, what does RTS represent?

12. (6 points) What do the ridgelines represent? Derive the ridgeline equations of this function?

13. (7 points) In words, explain why a profit maximizing firm never operates in the 1st production stage for given input and output prices.

14. (7 points) Consider the following factor demand function $x(p, w) = p/w^2$, where p is output w is input price. Is this a legitimate factor demand function for a profit maximizing firm?

15. (7 points) If a price-taking firm's production function is given by $y = x^{0.5}$. Show that its optimal supply function is $y(p, w) = p/2w$ where p is output w is input price.

16. (7 points) A profit maximizing firm with production function $y = f(x_1, x_2, x_3)$ will always increase the quantity demanded demand for factors $\mathbf{x}$ due to an increase in output price. True or False? Please explain.

Bonus (2 points) Who won the Nobel Prize in Economic Sciences this year? What is one of his/hers important contributions that we discussed in class?