

**Due: Monday, June 24 (in class)**

*Challenging questions are marked with \*.*

**Question 1:** Suppose  $U(x, y) = 4x^2 + 3y^2$ ,

1. calculate  $\partial U/\partial x$ ,  $\partial U/\partial y$ .
2. evaluate these partial derivatives at  $x = 1, y = 2$ .
3. write the total differential for  $U$ .
4. calculate  $dy/dx$  for  $dU = 0$ .
5. show  $U = 16$  when  $x = 1, y = 2$ .

**Question 2:** Log-linearize this multivariate function  $U(x, y, m, n) = x^\alpha y^\beta [m^\theta + n^\theta]^{\frac{1}{\theta}}$ .

**Question 3:** In this question we focus on the housing market in Toronto, Canada. Suppose that we know the demand function for a two-bedroom apartment in Toronto is  $Q^d = 120 - 0.2P$  and the supply function for the two-bedroom apartment in Toronto is  $Q^s = 20 + 4.8P$ :

1. solve for the competitive market equilibrium.
2. suppose that Toronto Mayor Rob Ford has adopted a price ceiling policy for the housing market by setting the ceiling price which is \$15. Calculate the quantity demanded and quantity supplied at the ceiling price. Is there a surplus or shortage in the housing market with this policy?
3. because of the market inefficiency in part (2), many people who are planning to settle in Toronto instead decide to buy an apartment in Guelph, a small city which is about 30 miles west of Toronto. Suppose the demand curve for housing in Guelph is the same as in Toronto,  $Q^d = 120 - 0.2P$ , but the supply curve in Guelph is  $Q^s = 20 + 9.8P$ . Solve for the competitive market equilibrium in Guelph.
4. suppose that Guelph Mayor also has adopted a price ceiling policy for the housing market by setting the ceiling price which is \$15. Calculate the quantity demanded and quantity supplied at the ceiling price. Is there a surplus or shortage in the housing market with this policy in Guelph?

**Question 4:** Suppose that the market demand function for gasoline is  $Q^d = 90 - 2P$ , market supply function for gasoline is  $Q^s = 30 + 4P$ :

1. calculate the equilibrium price and equilibrium quantity.
2. Suppose that due to natural resource constraints, the maximum quantity of market supply of gasoline cannot exceed 120. At the same time, thanks to a booming economy consumers are becoming richer, so the demand curve for gasoline has shifted to the right, now the demand function is  $Q^d = 150 - 2P$ . Calculate the new equilibrium price and equilibrium quantity. Sketch a graph showing this change.

**\*Question 5:** Perform comparative statics on this identity,  $D(p(a, b), a) = S(p(a, b), b)$ :

1. find the expression for  $\frac{\partial p}{\partial a}$ .

2. suppose you know that  $\frac{\partial p}{\partial b} < 0$ ,  $\frac{\partial S}{\partial b} < 0$ ,  $\frac{\partial D}{\partial a} > 0$ , and we have downward-sloping demand curve and upward-sloping supply curve, what can you say about the sign of  $\frac{\partial p}{\partial a}$ , positive or negative?

**Question 6:**

1. Suppose that you have this demand function,  $D(p) = a\frac{y}{p}$ , find the expression for the price elasticity of demand.
2. Suppose that you have this demand function,  $D(p, p_o) = p^\alpha p_o^\beta$ , find the expression for the **cross-price elasticity of demand**.

**Question 7:** Movie 12 of Ames charges its customers flat rate for all movie showings in theater (\$8 evening showing, \$5.50 matinee). We know that some movies are more popular than others in the sense that more people are willing to watch them in theater (higher quantity demanded). For example, The Avengers had maintained its box office title two weeks in a row, based on the standard supply and demand theory, we would expect the movie theater charges its customers a higher ticket price for watching The Avengers than other relatively less popular movies. But the reality is that almost all movie theaters either in the US or Canada still charge flat rate. What is wrong with the standard supply and demand theory introduced in all economics textbooks in this case? What is your own economic theory explaining this anomaly?