Problem Set 1 – Supply and Demand

1. In each case below, identify the effect on the market for steak.

   i) An increase in the price of lamb.
   ii) A decrease in the population.
   iii) An increase in consumer income.
   iv) A decrease in the price of steak sauce.
   v) An increase in advertising by chicken producers.
   vi) In each case below, identify the effect on the market for coal.

2. In each case below, identify the effect on the market for coal.

   i) The development of a new, lower cost mining technique.
   ii) An increase in wages paid to coal miners.
   iii) The imposition of a $2 per ton tax on coal.
   iv) A widespread news report that demand for coal will be much lower next year.
   v) A new government regulation requiring air purifiers in all work areas.

3. Consider the market for apple juice. In this market, the supply curve is given by $Q_S = 10P_J - 5P_A$ and the demand curve is given by $Q_D = 100 - 15P_J + 10P_T$, where *J* denotes apple juice, *A* denotes apples, and *T* denotes tea.

   i) Assume that P_A is fixed at $1 and $P_T = 5$. Calculate the equilibrium price and quantity in the apple juice market.
   ii) Suppose that a poor harvest season raises the price of apples to $P_A = 2$. Find the new equilibrium price and quantity of apple juice. Draw a graph to illustrate your answer.
   iii) Suppose $P_A = 1$ but the price of tea drops to $P_T = 3$. Find the new equilibrium price and quantity of apple juice.
   iv) Suppose $P_A = 1$, $P_T = 5$, and there is a price ceiling on apple juice of $P^*_j = 5$. What is the excess demand for apple juice as a result? Draw a graph to illustrate your answer.

4. A new chemical cleaning solution is introduced to the market. Initially, demand is $Q_D = 1000 + 2P$ and supply is $Q_S = 100 + P$. Determine the equilibrium price and quantity. The government then decides that no more than 300 units of this product should be sold per period, and imposes a quota at that level. How does this quota affect the equilibrium price and quantity? Show the solution using a graph and calculate the numerical answer.

5. Suppose demand for inkjet printers is estimated to be $Q = 1000 - 5P + 10P_x - 2P_z + 0.1Y$. If $P = 80$, $P_x = 50$, $P_z = 150$, and $Y = 20{,}000$; answer the following:

   i) What is the price elasticity of demand?
   ii) What is the cross-price elasticity with respect to commodity X? Give an example of what commodity X might be.
   iii) What is the cross-price elasticity with respect to commodity X? Give an example of what commodity X might be.
   iv) What is the income elasticity?

6. You have been asked to analyze the market for steel. From public sources, you are able to find that last year's price for steel was $20 per ton. At this price, 100 million tons were sold on the world market. From trade association data you are able to obtain estimates for the own-price elasticities of demand and supply on the world markets as −0.25 for demand and 0.5 for supply. Assume that steel has linear demand and supply curves throughout.

   i) Solve for the equations of demand and supply in this market and sketch the demand and supply curves.
   ii) Suppose that you discover that the current price of steel is $15 per ton and the current level of worldwide sales of steel is 150 million tons. The most recent elasticity estimates from the trade association this year are −0.125 for demand and 0.25 for supply. Describe the change in the supply and demand curves over the past year using your diagram from part (a). What sort of event(s) might explain the change?

7. Show that the supply function $Q = 10P^n$ has constant elasticity.