1. (4 points) Suppose the income elasticity of demand for a good is $-0.6$. By what percentage must income change in order to reduce demand by 3%? Must income increase or decrease by this percentage? What terminology would you use to describe the income elasticity of demand for this good?

2. (3 points) Suppose that a 16% increase in the price of good $X$ results in a 6% decline in the demand for good $Y$. Calculate the cross elasticity of demand for the two goods, and explain what terminology you would use to describe the cross elasticity of demand.

3. (4 points) If the absolute value of the price elasticity of demand for cheddar cheese is 0.60, by what percentage would the amount demanded fall if the price of cheddar cheese increased by 12%? Would the total amount of money spent on cheddar cheese be higher or lower after the 12% price increase? Explain your answer.

4. Suppose the demand for a good can be represented by a linear function $Q = 30 - 0.5P$ where $Q$ is quantity demanded and $P$ is price.

   a. (3 points) For what price is quantity demanded equal to 18? Calculate the absolute value of the price elasticity of demand at this point?

   b. (3 points) For what prices will the absolute value of the price elasticity of demand be less than 2?

5. (3 points) When the price of copper rises from $4 per pound to $5 per pound, the amount of copper supplied in the world rises from 13 million tons to 16 million tons. Calculate the price elasticity of supply between the two points.

6. Suppose coffee and tea are substitutes in consumption and we observe that 1) there has been an increase in the price of coffee and 2) there has been an increase in the quantity of tea bought and sold. Suppose further that the market for each of these goods is competitive.

   a. (4 points) Could an increase in the number of tea producers lead to both of these observations? Explain in words and graphs.

   b. (4 points) Could an increase in the cost of producing coffee lead to both of these observations? Explain in words and graphs.

7. (4 points) What does it mean for two goods to be substitutes in production? If a market is competitive, how do the price and quantity in that market change when there is a decrease in the price of a substitute in production? Explain in words and graphs.
8. (8 points) Write several paragraphs about the price elasticity of demand. Make sure your answer addresses the following questions: What are we trying to measure with the price elasticity of demand? Why is there any “elasticity” at all? (I.e., why isn’t it zero?) What makes this elasticity larger or smaller? How does the relationship between changes in price and changes in total revenue (i.e., price times quantity demanded) depend on the price elasticity of demand?

9. a. (5 points) Suppose there are two goods, whose quantities are denoted \( x \) and \( y \). The prices of the two goods are \( p_x \) and \( p_y \), and the consumer has income \( I \). Using words and graphs, discuss the consumer’s budget line. In particular, explain the economic meaning of the slope of the budget line. Also discuss the effect of an increase in \( p_y \).

b. (5 points) Suppose that the consumer has preferences over various bundles of the two goods. How are the consumer’s indifference curves defined? What is the economic meaning of the slope of an indifference curve? What properties do indifference curves have? Explain.