Question 1: What is the maximum amount you would pay for an asset that generates an income at the end of each of the four years if the opportunity cost of using funds is 8 percent?

Answer: We would use the formula for the present value in order to solve this:

\[ PV = \sum_{n=1}^{4} \frac{FV}{(1 + i)^n} \]

\[
PV = \frac{200000}{1.08} + \frac{200000}{(1.08)^2} + \frac{200000}{(1.08)^3} + \frac{200000}{(1.08)^4} = 662,425
\]

You would pay $662,425 for an asset that generates an income of $200,000 at the end of each year.

Question 2. To fund the war against Napoleon, the United Kingdom issued a perpetual bond that would pay £1 per year forever. Suppose the interest rate at the time of bond issuance was 5%. What would be the asking price for the perpetuity?

The asking price for the perpetuity would be \( \frac{1}{0.05} = £20 \).

Question 3. You work for a large investment advisory firm. Suppose one of your clients is three years away from retirement and has only $1,500 in pre-tax income to devote to either a Roth or a traditional IRA. The traditional IRA permits investors to contribute the full $1,500 since contributions to these accounts are tax-deductible, but they must pay taxes on all future distributions. In contrast, contributions to a Roth IRA are not tax-deductible, meaning that a tax rate of 25 percent, which is your client’s current rate, an investor is able to contribute only $1,125 after taxes; however, the earnings of a Roth IRA grow tax-free. Assuming that your client anticipates that her tax rate will be reduced to 15 percent in retirement and will earn a stable 7 percent return on her investments, will she prefer a traditional or a Roth IRA?
Question 4. The demand for good X is given by \( Q^d_x = 300 - 2P_x + 10P_y + 7P_z + 5M \). Research shows that the prices of related goods are given by \( P_y = $60 \) and \( P_z = $120 \), while the average income of individuals consuming this product is \( M = $800 \).

a) Indicate whether goods X and Y are substitutes or complements for good X.
   The coefficient for the price of good Y is positive. This means that as the price of good Y goes up, we purchase more units of good X. This makes X and Y substitutes.

b) Is X an inferior or a normal good?
   Income has a positive coefficient. X is a normal good. Increase in income by 1 unit raises consumption of X by 5 units.

c) How many units of good X will be purchased when \( P_x = $250 \)?

\[
Q^d_x = 300 - 2(250) + 10(60) + 7(120) + 5(800) = 5240
\]

d) Determine the demand function and inverse demand function for good X.
   The demand function:
   \[
   Q^d_x = 300 - 2P_x + 10(60) + 7(120) + 5(800) = 5740 - 2P_x
   \]
   The inverse demand function:
   \[
   P_x = 2870 - \frac{1}{2}Q^d_x
   \]

Question 5: Suppose demand and supply are given by \( Q^d_x = 30 - 2P_x \) and \( Q^s_x = 2P_x - 10 \).

a) Determine the equilibrium price and quantity.
   Answer:
   
   \[
   Q^d_x = Q^s_x
   \]
   \[
   30 - 2P_x = 2P_x - 10
   \]
   \[
   4P_x = 40
   \]
   \[
   P_x = 10
   \]
   \[
   Q^d_x = 10
   \]

b) Suppose a $5 excise tax is imposed on the good. Determine the new equilibrium price and quantity.
   Before tax:
   
   \[
   D(p_e) = S(p_e)
   \]
   where \( p_e \) is the equilibrium price.
After tax:

\[ D(p_c) = S(p_c + t) \]

\[ Q_x^* + 10 = 2P_x \]

\[ P_x = \frac{1}{2}Q_x^* + 5 \]

We add $5 to the supply price:

\[ P_x = \frac{1}{2}Q_x^* + 10 \]

Our inverse demand function is:

\[ P_x = 15 - \frac{1}{2}Q^d_x \]

Now equating the supply with our demand curve:

\[ \frac{1}{2}Q_x + 10 = 15 - \frac{1}{2}Q_x \]

\[ Q_x = 5 \]

Note:
The supplier gets $7.5 per unit, the consumer pays $12.5 per unit and the government generates a revenue of $5 per unit.

c) How much tax revenue does the government earn with $5 tax?
The government earns $5 \times 5 = $25 with the $5 tax. It generates $5 for each of the 5 units that are sold under equilibrium conditions.

Question 6: Shrimp farmers in several Gulf states have successfully lobbied the Obama administration to impose a punitive import tariff on shrimp imported from Vietnam, Thailand and China on the ground that foreign shrimp farmers engage in unfair competition by dumping. To appease angry customers, the Department of Commerce is considering a measure to restrict shrimp retailers to sell them only at the price prior to the punitive import tariff. What would happen to the price and quantity of the shrimp market had the measure passed? Draw a graph to discuss the comparative statics before and after the tariff as well as the price setting restriction?

Answer: The price of the shrimp will fall as the farmers will be forced by the government to sell at a lower price, the price before the import tariffs are applied. This will reduce the amount of shrimp supplied by the domestic farmers and will increase the demand of shrimp. If the price falls below the equilibrium price, we may face a shortage of shrimps produced by the domestic farmers.
Question 7: Name one factor that affects own price elasticity and give an example:
Answer: The number of substitutes available for a product. For instance, the introduction of hybrid and more efficient cars could affect the own price elasticity of gas-guzzling automobiles.

Question 8: The demand curve for a product is given by $Q^d_x = 500 - 3P_x + 2P_z$, where $P_z = $20.
   a) What is the own price elasticity when $P_x = $150? Is demand elastic or inelastic at this price. What would happen to the firm’s revenue if it decided to charge below $150?
Answer:
The own price elasticity can be written as:
$$\frac{\partial Q_x}{\partial P_x} \cdot \frac{P_x}{Q_x} = -3 \cdot \frac{150}{90} = -3 \cdot \frac{5}{3} = -5$$
As the absolute elasticity is greater than 1, we have a price elastic demand curve.

When the price is elastic, a fall in price would lead to higher revenue. For instance, if the price is $150, quantity demanded is 90 units. The total revenue is $13,500. Now, if the price was to fall to $120, the quantity demanded will increase to 180 units. The total revenue will now be $21,600. Therefore, a fall in price will increase revenue.

Note:
The ordinary demand function is
$$Q^d_x = 540 - 3P_x$$
The inverse demand function is:
$$P_x = 180 - \frac{1}{3}Q^d_x$$
The midpoint price of the demand function is $90.
So at $90, we have unitary elasticity. Above the price, we have an elastic demand function and below the price our demand function is inelastic.
   b) What is the own price elasticity of demand when $P_x = $50? Is demand elastic or inelastic at this price? What would happen to the firm’s revenue if it decided to charge a price above $50?
Answer:
The own price elasticity can be written as:
$$\frac{\partial Q_x}{\partial P_x} \cdot \frac{P_x}{Q_x} = -3 \cdot \frac{50}{390} = -3 \cdot \frac{5}{39} = -\frac{15}{39}$$
The demand is inelastic at this price as the absolute value is less than 1.
If a price above $50 is charged, we would have an increase in revenue.

c) What is the cross-price elasticity of demand between good X and good Z when \( P_x = \$150 \)? Are goods X and Z substitutes or complements?

\[
\frac{\partial Q_x}{\partial P_z} \cdot \frac{P_z}{Q_x} = 2 \cdot \frac{20}{90} = 2 \cdot \frac{2}{9} = \frac{4}{9}
\]

Goods X and Z are substitutes. A rise in price of Z will lead to a higher consumption of X.

Question 9: GE recently implemented an across-the-board price reduction by 5% for its transportation products. Immediately, the number of order increases by 10%. What can you infer about the own price elasticity of demand for GE’s transportation division? Can you predict whether the revenues of DASH 9 propulsion locomotive, a product of GE’s transportation division, increase or decrease given a price raise?

Answer 9: A % reduction in price leading to a more than 1:1 ratio increase in % of quantity demanded reveals a price elastic demand curve. For instance, if 100 units are sold for $100 each and a 5% reduction in price ($95) leads to rise in units by 10% (110), will cause the total revenue to rise from $10,000 to $10,450. This means that the demand is price elastic if we observe the behavior of the market as is defined in this question.

Question 10: