1 Question #1 National Security Problem

Assume that the U.S. oil demand is represented by the following demand function:

\[ P_d = 35 - 0.20q_d \]

and the Supply curve (which represents the oil producers) is:

\[ P_s = 10 + 0.15q_s \]

where \( P_d \) and \( q_d \) are price and quantity demanded respectively. Notice that \( P_s \) is the price charged by the suppliers and \( q_s \) is the quantity supplied.

1. Find the optimal quantity and price in the oil market.
2. Assume that the oil world price is $7. Find the quantity produced by U.S. firms and quantity demanded by U.S. consumers.
3. How many units U.S. will import?
4. Assume that the vulnerability premium is equal to $3. Find the new quantity produced by U.S. firms and new quantity demanded by U.S. consumers.
5. Identified the new quantity of oil imported from foreign countries.
6. Draw a graph and identify the size of efficiency loss.
7. Determine the price elasticity of demand when the new price is $7. Is the demand elastic or inelastic? Explain, in your own words, the result

2 Question #2 Recyclable Resources

A can of Coke can be produced using virgin ore (aluminium) at a marginal cost given by \( MC_1 = 0.4q_1 \) and with recycled aluminium at a marginal cost given by \( MC_2 = 0.4 + 0.1q_2 \).

1. If the inverse demand curve were given by \( P = 10 - 0.2(q_1 + q_2) \), how many units of the product would be produced with virgin ore and how many units with recycled materials?
2. If the inverse demand curve were \( P = 0.5 - 0.15(q_1 + q_2) \), what would your answer be?
3. Illustrate your answer on a clearly labeled graph

3 Question #3 The Efficient Allocation of Surface Water

Elliot and Craig have different marginal benefits from water. [You can ask them why]; Elliot’s marginal net benefit is \( MNB_E = 20 - 0.5q \) and Craig’s marginal benefit is \( MNB_C = 10 - 0.5q \) (where \( q \) is quantity of water).

1. What is the optimal allocation of water when the total supply is 80?
2. What is the optimal allocation of water when the total supply is 55?
3. The total precipitation during the year was extremely low, reducing the total supply of water (part 2) by a 66% What is the optimal allocation of water?
4 Question #4 (Land Use)

Allison has to decide where to build her house. She knows that her bid rent function is $X_{RD} = 80 - C$ (where $RD$ represent the residential development and $C$ distance to the center of the city). Matt would like to find a place where to build his farm. His bid rent function is $X_{AG} = 60 - 0.6C$ ($AG$ is agriculture). Finally, if the land is left in its natural state the bid rent function is $X_W = 20 - 0.16C$. ($W$ is wilderness)

1. Find what is the range (miles) in which Allison should build her house
2. Find the range (miles) in which Matt should build his farm

5 Question #5 (The Market Food)

Assume that the international market of Rice is composed by two Countries (China and France). The demand functions of rice in China and France are $P_{China} = 100 - 2q$ and $P_{France} = 80 - q$, respectively. The total supply of rice is 20 tons. Some serious shortage is affecting the market of rice, in fact, the total production has decreased by 50%.

1. Find the new equilibrium price in France and China. Explain why one of the countries is more affected by the shortage of food.
2. What is the change in total revenue?

6 Question #6 (Soil – loss Relationship)

Let us assume that a field in Palouse produces yields of 20 bushels per acre when the topsoil is zero. The manager productivity (from 0 to 100) is 75 (measure in bushels per acre). The marginal product is .55 and topsoil depth of the land is 40 inches.

The area of Palouse experienced one of the worst winters during 2007, which has produced negative effects on the field (erosion). In fact, some scientists have estimated an average rate of topsoil loss of 30 inches.

The landowner dedicates 15% of her land to some conservation practice (grassed waterways). Finally, the landowner bought new machines to be used on the field; they will increase the production of wheat by 20%.

1. What will be the crop yield in 2008?