Down Pillows Market

1. In a perfectly competitive market, the demand curve for down pillows is given by $Q = 100 - P$ and the supply curve is given by $Q = -20 + 2P$.
   a. Find the equilibrium price and quantity for down pillows in the market.
   b. Find the price elasticity of demand and price elasticity of supply at the equilibrium price.
   c. Find the consumer surplus and producer surplus at the market equilibrium.
2. Suppose the government imposes a $15 tax on the sales of down pillows.
   a. Find the price the seller receives, price the buyer pays, and the quantity sold under the tax.
   b. Find the deadweight loss which results from the tax.
   c. Find the consumer's share of the tax burden and the producer's share of the tax burden.
3. Consider a market without the $15 tax, but the production of down pillows imposes an external marginal cost of $30 per pillow.
   a. Find the socially optimal price and quantity given the negative externality.
   b. What value of a Pigouvian tax is needed to bring the market to the social optimum?
4. Now suppose there is only one firm in the down pillow market. The inverse demand curve the firm faces is $P = 100 - Q$, and the marginal cost of production for the firm is given by $MC = 10 + 0.5Q$.
   a. Find the monopoly price and quantity.
   b. Find the producer surplus for the firm.
5. Suppose instead, there are two firms in the down pillow market selling identical products, firm A and firm B. The inverse demand curve is still $P = 100 - Q$, and both firms have identical marginal cost of production, $MC = 10 + 0.5Q$.
   a. If both firms agree to form a collusive monopoly, find the quantity each firm will produce, the price for down pillows in the market, and each firm's producer surplus.
   b. If both firms compete in a Cournot oligopoly, find the quantity each firm will produce, the price for down pillows in the market, and each firm's producer surplus.
   c. If both firms compete in a Stackelberg oligopoly where firm B moves first, find the quantity each firm will produce, the price for down pillows in the market, and each firm's producer surplus.
   d. If both firms compete in a Bertrand oligopoly, find the quantity each firm will produce, the price for down pillows in the market, and each firm's profit.