EXAM SØK1011 V2022 – ENGLISH

Task 1 (15 %)

a) Most goods can be classified with respect to their degree of excludability and rivalry. **Describe in your own words what these classifications mean and provide examples of four goods or services that are different with respect to both excludability and rivalry.**

b) **What is a public good? How can we determine the efficient level of production of a public good?**

Assume we are in an economy with two individuals, named Doriane and Lana. They are considering investing in a carbon capturing technology (CCT) that can slow down global warming. Doriane is generally concerned about the environment. If this CCT is produced, she will have a utility of 160. Lana is less worried than Doriane but realises that investing in technologies that limit global warming is probably smart if it doesn't cost too much. She will receive a utility of 100 if the CCT is produced. The cost of producing the CCT is 170.

c) **What type of good is the CCT? What is the economic surplus of the project? Should the CCT be produced? Will the good be produced? How can we make sure the project is realised?**

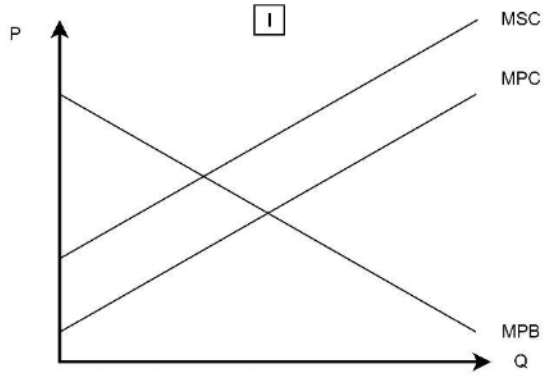
Imagine now that Doriane's utility if the CCT is produced will be 180.

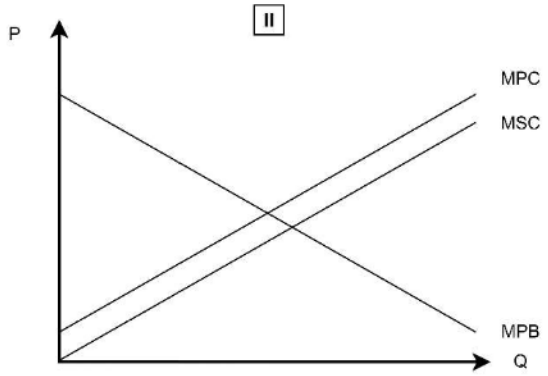
d) **Which implication does this have for the production of the CCT and the individual gains compared to the situation in 1c?**

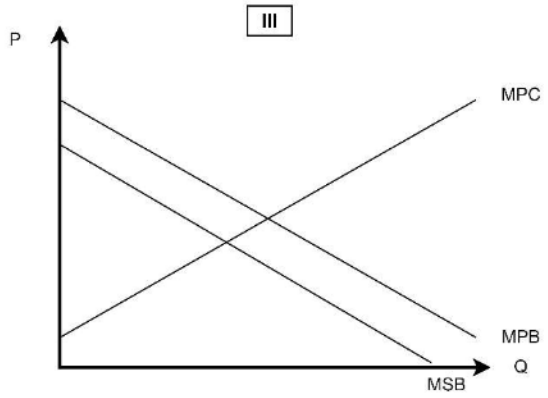
Task 2 (5 %)

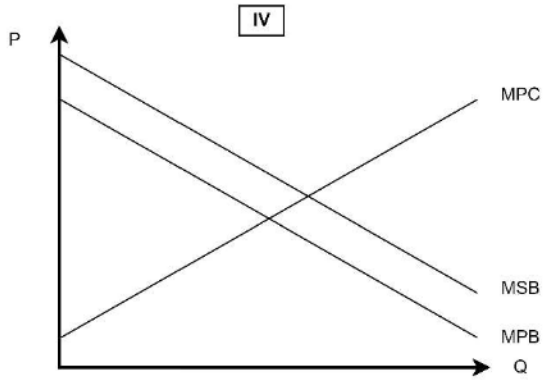
Consider the four graphs. They depict markets with perfect competition. MPC represents the firm's marginal cost, and MSC represents the societal marginal cost. MPB represents marginal private benefit, and MSB represents marginal societal benefit.

In which of these markets do we have positive externalities and in which of these markets do we have negative externalities? Provide one example for each graph of situations where these externalities might appear. Explain for each graph if the optimal production is lower or higher than the market solution.









Task 3 (30 %)

The production of a good x leads to pollution that is harmful for the environment. The damage function is given by $C_s(x) = 3x^2$, where x is the total production of the good. Assume that the good is produced under perfect competition. The market cost function of producing the good is given by $C(x) = 5x^2$. The market price of the good is given by $P = 1600 - x$.

a) **Find the level of production of x under perfect competition. What is the damage of production for society?**

b) **What is the optimal production? What is the damage for society under optimal production? Draw a graph showing both the market solution and the optimal solution.**

Consider now a situation similar to a) and b), but the demand is now given as $\mathrm{P} = 900$.

c) **Draw a graph and calculate the level produced in the market and the optimal level of production. Calculate the damage of both production outcomes.**

Use the level of production in both the market and optimal situation found in task c. Imagine that one extra unit is produced in both cases.

d) **Calculate the new damage of production in the optimal and the market situation. Comment on the result.**

e) **How can the market and optimal production be aligned?**

Task 4 (50 %)

Consider a firm which faces the following demand curve for its product:

$$P = 100 - 5X$$

Where P is the price of the product and X the quantity. The firm has a true marginal cost equal to 20.

The firm has a profit maximizing behavior.

a) **What are the price and the quantity at the equilibrium for this market in a perfect competition setting? What are the profit of the firm and the consumer surplus in that case?**
Use as notation P_P for the price in equilibrium, X_P for the quantity in equilibrium, π_P for the profit of the firm and CS_P for the consumer surplus in the perfect competition setting.

b) **Calculate the price and the quantity at the equilibrium in the monopoly case.**
Use as notation P_M for the price in equilibrium, X_M for the quantity in equilibrium.

c) **Show the monopoly equilibrium in a graph and illustrate the socioeconomic loss of efficiency by the monopoly. Explain briefly why an efficiency loss occurs.**

d) **Calculate the profit of the monopolist, the efficiency loss and the consumer surplus. Compare those values to the one calculated in question a) and conclude.**
Use as notation L_M for the efficiency loss in the monopoly setting.

Imagine that the state wants to regulate the monopoly. The state decides to regulate by setting the price on the market. The aim of the state is to maximize the socioeconomic surplus. If the firm incurs a deficit due to the price regulation, the state must compensate for it. The state wants to avoid a deficit of the firm.

e) **What is the optimal price the state should choose?**

In reality, the state is not able to observe the true marginal cost of the firm. The state decides to ask the firm what its marginal cost is before setting the price. The state cannot know whether the firm is going to tell the truth or not.

f) **Given the monopolist objective, what marginal cost should it tell the state? Is the monopolist going to report its true marginal cost? Explain briefly.**

The state has doubts about whether the firm is telling the truth.

g) **What is the equilibrium quantity if the state sets the price equal to 10? Calculate the profit of the firm, the efficiency loss and the consumer surplus.**
Use as notation P_{R1} for the price in equilibrium, X_{R1} for the quantity in equilibrium, π_{R1} for the profit of the firm, CS_{R1} for the consumer surplus and L_{R1} for the efficiency loss.

h) **What is the equilibrium quantity if the state sets the price equal to 50? Calculate the profit of the firm, the efficiency loss and the consumer surplus.**
Use as notation P_{R2} for the price in equilibrium, X_{R2} for the quantity in equilibrium, π_{R2} for the profit of the firm, CS_{R2} for the consumer surplus and L_{R2} for the efficiency loss.

Imagine now that this is a game where the two players are the firm and the state.

The firm can either tell the truth about its marginal cost or lie about it. If the firm tells the truth, it tells the state its true marginal cost. If the firm lies, it tells the state that its marginal cost is the one found in question f).

The state can trust the firm or not. If the state trusts the firm, it assumes the marginal cost is the one given by the firm. If the state does not trust the firm, it assumes the marginal cost is the one given by the firm minus 10.

i) **Establish the payoff matrix for this game.**

j) **What is the Nash equilibrium of this game? Explain how you find it and comment on this equilibrium.**