1.

Consumer has the following utility function $U(x_1, x_2) = x_1 + x_2$,
where x_1 and x_2 are the amounts of consumed goods 1 and 2.

The price of good 1 is $p_1 = 4$ and the price of good 2 is $p_2 = 2$. Consumer has a disposable income of $m = 8$.

a) What kind of preferences does the utility function represent?
Draw indifference curves for utility levels $U' = 2$, $U'' = 4$ and $U''' = 6$. 2p

b) Draw also the budget line in the figure.
Mark the utility-maximizing point (x_1^*, x_2^*) in your figure.
What is the highest level of utility the consumer can achieve? 2p

c) Does the utility function $V(x_1, x_2) = x_1^2 + 2x_1 x_2 + x_2^2$ represent the same preferences as $U(x_1, x_2)$?
Explain. 2p

2.

Firm has a production function: $y = f(x_1, x_2) = x_1^{0.5}x_2^{0.5}$,
where x_i is the amount of input i and y is the amount of output.

    a) Does the technology exhibit decreasing, increasing or constant returns to scale?
       Derive your answer by using a scaling factor k. 2p

    b) Derive the marginal products for both inputs (MP_1 and MP_2) as well as the technical rate of substitution (TRS). 2p

Assume that prices of the inputs are $w_1 = 1$ and $w_2 = 1$. The firm minimizes its costs, given the output level y.

    c) Derive the cost-minimizing conditional input demands $x_1^*(w_1, w_2, y)$ and $x_2^*(w_1, w_2, y)$. 2p

3.

a)

The table below describes a factory's costs:

Quantity (Q)	Fixed costs (FC)	Variable costs (VC)	Total costs (TC)	Marginal costs (MC)	Average fixed costs (AFC)	Average variable costs (AVC)	Average total costs (ATC)
1	18	26		26			
2		44					
3		60					

Copy the table in your answer sheet and fill in the missing values. Show the calculations behind your answer. 2p

b)

Another firm has a following short-run cost function: $c(q) = q^2 + 3$, where q is the amount of output.

Write down the following cost functions: average costs AC(q), average variable costs AVC(q) and marginal costs MC(q).

In a diagram, draw the marginal cost curve MC(q) and the average variable cost curve AVC(q).
The firm operates in a perfectly competitive industry. What is the inverse supply curve $S^{-1}(q)$?
Explain shortly the three conditions that you have to consider, when you solve $S^{-1}(q)$.   4p

4.

   a) Explain the difference between an ordinary good and a Giffen good.
      Explain the difference between a normal good and an inferior good.   2p

   b) Explain the concept of (own) price elasticity of demand.
      Calculate the elasticity of demand for a linear demand $D(p) = a - bp$,
      where a and b are paremeters, p is price and $D(p)$ is quantity demanded.   2p

   c) Consider a consol that pays 100 €per period forever. Let r denote the interest rate per period.
      Write down the consol's present value equation.
      Assume now that $r = 10\%$. Solve the consol's present value.   2p

5.

Demand for hair wax is given by equation: $q = 250 - 2{,}5p$, where q is quantity and p is price.
The total cost of production is given by the equation: $c(q) = 0{,}1q^2 + 500$.
<u>Hair wax is produced by one firm only</u>.

   a) Write down the inverse demand function $p(q)$? 1p

   b) Write down the monopoly's profit function $\pi(q)$. 1p

   c) What is the profit maximizing output q^m for the monopoly?
      What is the profit maximizing price $p(q^m)$?
      At what level are the marginal costs $MC(q^m)$? 2p

   d) Is this monopoly market outcome Pareto-optimal?
      Use the result in part c) and explain your answer. 2p