1. Consider the following cost functions, where \( q \) represents power.

(a) \( c(q) = \frac{1}{5}q^2 \)
(b) \( c(q) = \frac{1}{2}(e^q - 1) \)

For each one of them

(a) calculate and draw its corresponding marginal cost of \( q \)
(b) calculate and draw its corresponding supply function for power
(c) calculate and draw its corresponding producer’s surplus when the market price of power is \( p \).
(d) answer the following: If the price of power was \( p = 1 \),
   i. what would be the quantity the firm would like to generate
   ii. what would be the cost of producing an additional unit of power?
(e) answer the following: If the price of power was \( p = 2 \),
   i. what would be the quantity the firm would like to generate
   ii. what would be the cost of producing an additional unit of power?
(f) answer the following: If the price of power was \( p \),
   i. what would be the quantity the firm would like to generate
   ii. what would be the cost of producing an additional unit of power?

2. Consider the following supply functions of \( q \).

(a) \( q(p) = 10p \)
(b) \( q(p) = 5p^2 \)
(c) \( q(p) = 2e^p - 1 \).

For each one of them

(a) draw its corresponding supply curve (with \( p \) in the vertical axis)
(b) calculate the change in its corresponding producer’s surplus when the price of \( q \) increases from 1 to 2. Draw.
(c) answer the following: If the price of power was \( p \),
   i. what would be the quantity the firm would like to generate
   ii. what would be the cost of producing an additional unit of power?

3. Below you are given pairs composed of a cost function and a utility function.

(a) \( c(q) = \frac{1}{2}q^2 \) and \( u(x, y) = y + 2 \ln(x) \)
(b) \( c(q) = \frac{1}{10}q^2 \) and \( u(x, y) = y + 4x(20 - x) \).

For each such pair

(a) find and draw the corresponding supply and demand functions for power
(b) calculate the competitive equilibrium of the market
(c) find the consumer’s willingness to pay for an additional unit of power at the market equilibrium
(d) find the firm’s cost of production an additional unit of power at the market equilibrium
(e) check that the competitive allocation maximizes the social surplus.