

# Exercise 1: Oligopoly and Product Differentiation

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## Instructions

- Answer all questions.
- Show intermediate steps.
- Solutions are included only when `params.solution: true`.

## Problem 1: Welfare analysis

Consider the example exercise in Lecture 1, where

$$P = 20 - Q$$

and there are three firms with cost function  $c_i(q_i) = c_i q_i$  with

$c_1 = 0$ ,  $c_2 = 5$ , and  $c_3 = 7$ .

**(a)**

Compute the Nash equilibrium of the Cournot duopoly game between firm 1 and firm 2.

**(b)**

Given your answer to (a), compute the equilibrium profits, consumer surplus, and welfare loss.

**(c)**

Compare the values in (b) to those of the other three market structures (perfect competition, monopoly, Cournot triopoly) in Lecture 1. Discuss any policy implications for a social planner who maximises total welfare.

## Problem 2: Linear Hotelling model with monopoly

Consider the Hotelling linear-city model. Suppose there is only one restaurant, located at the centre of a street of length 1 km. The restaurant's cost is zero.

Consumers are uniformly distributed on the interval  $[0, 1]$ , with one consumer at each point. Transportation cost is £1 per kilometre.

The utility of a consumer located at distance  $a$  from the restaurant is

$$U = B - a - p,$$

where  $p$  is the price of a meal and  $B$  is a constant.

If the consumer does not eat at the restaurant, utility is

$$U^* = 0.$$

**(a)**

Suppose  $0 < B < 1$ . Find the number of consumers eating at the restaurant. Calculate the monopoly price and profit.

**(b)**

Answer the previous question assuming  $B > 1$ .