1. Question 1 (30 points)

A monopolist faces two kinds of consumers: students and non-students. The demand curve of each student is \( q = 100 - 2p \). The demand of each non-student is given as \( q = 100 - p \). There are \( x \) students and \( y \) non-students. There is a zero marginal cost of production.

(a) First suppose that the monopolist must set a single price to sell to all consumers. What price would the monopolist charge? How much would each student consume? And each non-student?

(b) Now suppose that the monopolist can charge different prices to students and non-students. What price would the monopolist charge in each market? How much would each student consume? And each non-student?

(c) Compute the social welfare in (a) and (b). When does the single price regulation (under (a)) generate higher welfare than in (b)?

2. Question 2 (40 points)

To produce output of a homogenous good, each firm must pay a fixed cost of \( \$f \) and a marginal cost of \( \$c \) per unit. The demand curve for this good is \( p = a - bQ \), where \( Q \) is the total output in the industry. Assume \( a - c > 0 \) and \( b > 0 \).

(a) First suppose that there are \( n \) firms in the industry who have paid the fixed cost. Suppose that they compete as Cournot quantity setting oligopolists. How much will each firm produce? What will be the market price and the total quantity produced?

(b) Now suppose that firms will exit the industry if their profit (net of fixed cost) is negative and that identical firms may enter if there are profits to be made. How many firms will enter? [Remember that your answer must be an integer].

(c) What happen to the number of firms in the industry and prices as \( f \) becomes small? Give some economic intuition for your answer.
3. Question 3 (30 points)

Two firms produce an identical good. The inverse demand curve for the good is
\[ P = 101 - X, \]
where \( X \) is the total quantity produced by the two firms. Firm 1 has a constant marginal cost \( 1 \) of producing the good. Firm 2 has a constant marginal cost \( 1 + c \) of producing the good, with \( 0 < c < 100 \).

(a) Suppose each firm \( i \) produces and sells \( x_i \) units of the good. Write down an expression for firm \( i \)'s profits (as a function of the output of each firm).

(b) Suppose that each firm compete as quantity setting duopolists. What quantities will they produce, what is the market price and how much profit does each firm earn?

(c) Suppose that firm 1 decides how much to produce first; firm 2 chooses only after observing firm 1’s choice. What quantities will they produce, what is the market price and how much profit does each firm earn?