ECN 453: Calculus for Cournot Competition

Nicholas Vreugdenhil

Calculus for Cournot Competition

- Next we will study Cournot Competition (competition on quantities)
- Before we get into the details, let's review some (relatively simple) calculus we will use when analyzing this model.

Maximizing Profit

- Before, we used that profit is maximized at $MR = MC$.
- We can also do profit maximization with calculus

Finding the quantity that maximizes profit: steps

- 1. Write down profit (profit=TR-TC)
- 2. Take the derivative of profit with respect to q
- 3. Set the derivative equal to 0
- 4. Solve for q

Finding the quantity that maximizes profit: example from calculus.pdf

- To remember how to use these steps, let's do the example from the notes.
- **Question:** Suppose that demand is $q = 10 - 2p$ and marginal cost is 2.
- 1. What is the firms profit?
- 2. What level of output maximizes profit?

Finding the quantity that maximizes profit: typical Cournot example

- **Question:** Total demand is given by $Q = q_1 + q_2$ where q_1 is the output of firm 1 and q_2 is the output of firm 2. Suppose that the total demand curve is $Q = 10 - 2p$ and marginal cost is 2.

- 1. What is firm 1's profit?

- 2. If firm 2's quantity q_2 is fixed, what level of firm 1's output q_1 maximizes profit?

Finding the quantity that maximizes profit: typical Cournot example

- **Question:** Total demand is given by $Q = q_1 + q_2$ where q_1 is the output of firm 1 and q_2 is the output of firm 2. Suppose that the total demand curve is $Q = 10 - 2p$ and marginal cost is 2.

- 1. What is firm 1's profit?

- Answer: Profit $= 5q_1 - 0.5q_1^2 - 0.5q_2q_1 - 2q_1$.

- 2. If firm 2's quantity q_2 is fixed, what level of firm 1's output q_1 maximizes profit?

- Answer: $q_1 = 3 - 0.5q_2$.