ECON 321, Assignment 18: BP Chapter 16: 16.2 Capacity and Entry Deterrence

Read 16.2.1. As you go along, model the following in Mathematica:

There is an industry with inverse demand curve $p(Q) = 100 - 4Q$. There is a first-mover firm that has marginal cost of 30 to build capacity and marginal cost of 10 to use capacity. There is an entrant firm that can pay entry cost $e = 90$ to enter the industry and then has marginal cost of 30.

The firms play a two-stage game. In stage 1, firm 1 chooses a capacity k_1 at total cost $30k_1$.

In stage 2, firm 2 chooses whether to enter and the firms then compete as Cournot competitors. Firm 1 can produce at marginal cost 10 up to its capacity k_1 and at marginal cost 40 beyond its capacity.

1. Find the Stage 2 reactions functions for Firm 1 and Firm 2. Note that Firm 1 has two reaction functions, one for each of its two different marginal costs 40 and 10.
2. Plot a Cournot reaction function diagram for the two firms.
3. Find each firm's quantities and profit at the two potential Cournot equilibria where the reaction functions cross.
4. Now find firm 2's net profit when firm 1 has committed to a particular quantity q_1. Show that this is

$$\pi_2(q_1) = \frac{(70 - 4q_1)^2}{16} - 90$$

   This is the same as the Stackelberg follower profit, but here we are just going to use it to figure out what quantity would deter entry.

Specifically, what quantity $\tilde{q}_1$ would drive this Stackelber follower profit to 0? Show on the reaction function diagram.

This essentially gets us to Figure 16.3 in the reading. We will pursue the rest of the argument in class.