In class problems – Chapter 12: Oligopoly

Given the following inverse demand curve: P(Q) = 100 – 5Q
Assume two firms are Cournot competitors, and both firms face the following cost curves: C(q) = 10Q

1) Find both firm's best response functions (reaction curves);

$\pi_1 = (100 - 5(q_1+q_2))q_1 - 10q_1$

$$\frac{d\pi_1}{dq_1} = 100 - 10q_1 - 5q_2 - 10 = 0$$

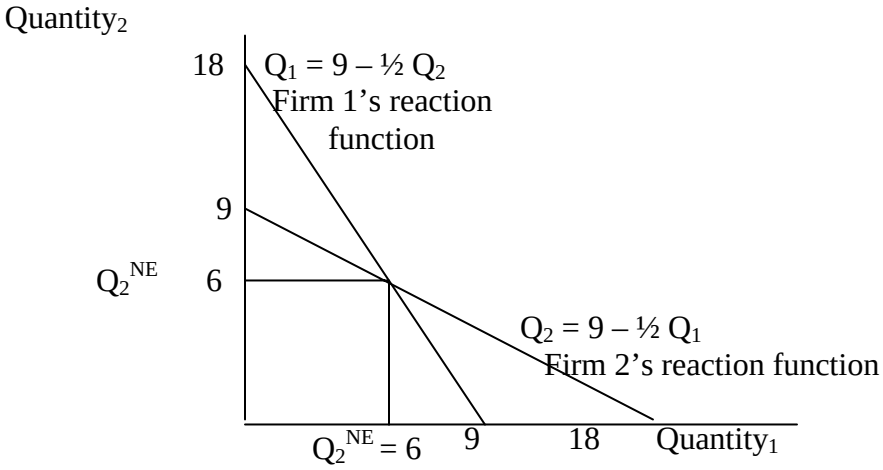
$$q_1 = \frac{90 - 5q_2}{10} = 9 - \tfrac{1}{2}q_2$$

This is the best response function for firm 1
by symmetry (they have the same cost curves)

$$q_2 = 9 - \tfrac{1}{2}q_1$$

This is the best response function for firm 2

2) Show Graphically



3) What is the Nash Equilibrium if firms are Cournot competitors?
Simultaneously solving the best response functions:

$$q_1 = 9 - \tfrac{1}{2}(9 - \tfrac{1}{2}q_1) = 4.5 + \tfrac{1}{4}q_1$$

$$\tfrac{3}{4}q_1 = \tfrac{9}{2}$$

$$q_1 = 6$$

$$q_2 = 6$$

4) What is the Nash Equilibrium if firms are Bertrand competitors?

P = MC → P = 10, so firms split market demand P = 100 – 5Q = 10 → Q = 18 and Q = $Q_1 + Q_2$, so $Q_1 = Q_2 = 9$