Homework Problem: For the following example of a Dixit Entry Deterrence model, determine if (a) entry is strategically deterred in a subgame perfect Nash equilibrium when $F_2 = 100$, and if (b) entry is strategically deterred in a subgame perfect Nash equilibrium when $F_2 = 135$.

Model Information
Inverse demand is $P = 200 - q_1 - q_2$
Cost of capacity needed per unit of output, $r = 49$
Cost of labor needed per unit of output, $w = 70$
$F_1 = \text{fixed cost for firm 1}$
$F_2 = \text{fixed cost for firm 2 incurred in firm 2 enters}$

To help you solve this homework problem, here are the basic steps involved in solving for the subgame perfect Nash equilibria of Dixit’s Entry Deterrence game.

Step 1. Derive the best quantity responses for each firm assuming that firm 1 has no sunk capacity costs (that is, firm 1 has no pre-installed capacity).

Set up a graph with $q_1$ and $q_2$ plotted on each axis. Graph each firm’s best quantity response functions from this step using dashed lines. Calculate the Cournot equilibrium implied by these best response functions. Label this quantity pair as point A in your graph.

Step 2. Derive firm 1's best quantity response assuming that firm 1 has enough pre-installed capacity. In this case only labor costs are variable.

Add this function to your graph again using a dashed line. Calculate the Cournot equilibrium using firm 1's best quantity response function from this step and firm 2's best quantity response function from step 1. Label this quantity pair as point B in your graph.

Step 3. Explain how firm 1's choice of capacity allows it to induce any point on firm 2's best quantity response curve between A and B. (Ignore the issue of whether or not firm 2's profits are non-negative for now.)

Step 4. Calculate the Stackelberg equilibrium given firm 2's best response function from step 1 when firm 1 is the leader. Label this equilibrium as point S on your graph. Calculate firm 1's profits at this quantity pair.

Step 5. What is the smallest amount of capacity firm 1 can choose that would cause firm 2 to stay out of the market? Explain. Calculate firm 1's profits assuming it invests in the minimal amount of capacity that will deter entry.

Step 6. Show whether or not entry is strategically deterred if $F_2$ equals 100 and if $F_2$ equals 135.