21. Correct. **The answer is false.** The profit functions for the two firms given the other firms output are:

$$\pi_1 = (200 - 0.7(q_1 + q_2))q_1 - 1.5q_1^2,$$

$$\pi_2 = (200 - 0.7(q_1 + q_2))q_2 - 1.8q_2^2.$$

First order conditions for profit maximization for the firms are:

$$\partial\pi_1/\partial q_1 = 200 - 0.7(q_1 + q_2) - 0.7q_1 - 3q_1 = 0.$$

$$\partial\pi_2/\partial q_2 = 200 - 0.7(q_1 + q_2) - 0.7q_2 - 3.6q_2 = 0$$

These equations can be rearranged into reaction functions as

$$q_1 = (200 - 0.7q_2)/4.4 = 45.455 - 0.159q_2$$

$$q_2 = (200 - 0.7q_1)/5 = 40.0 - 0.14q_1.$$

In the Stackleberg model, the firms do not collude, but the dominant firm, often called the price leader, optimizes given the other firm's reaction function.

Thus using the above equations:

$$\pi_1 = (200 - 0.7(q_1 + q_2))q_1 - 1.5q_1^2 = 200q_1 - 0.7q_1^2 - 0.7q_2q_1 - 1.5q_1^2$$

$$= 200q_1 - 2.2q_1^2 - 0.7q_2q_1$$

Now substitute 2's reaction function into π_1

$$= 200q_1 - 2.2q_1^2 - 0.7(40.0 - 0.14q_1)q_1 = 172q_1 - 2.102q_1^2$$

First order conditions for 1 are:

$$\partial\pi_1/\partial q_1 = 172 - 2*2.102q_1 = 172 - 4.204$$

$$q_1 = 0$$

q_1 = 172/4.204 = **40.913**

q_2's reaction function is the same as before

q_2 = 28.0 - 0.14q_1 = 40.0 - 0.14(40.913) = **34.272**

Finally, the price can be calculated from the inverse demand equation as follows,

$P = 200 - 0.7(q_1 + q_2)$. $= 200 - 0.7(40.913 + 34.272) =$ **147.37**