OPMT 5701
MyMathLab 2 variable Max

Question 6:
We are given

$$\begin{aligned} TC_1 &= 10Q_1 \\ TC_2 &= Q_2^2 \end{aligned}$$

and the demand function is:

$$P = 200 - 3Q$$

where $Q = Q_1 + Q_2$
Total revenue is

$$TR = PQ = 300Q - 3Q^2$$

substitute in $Q = Q_1 + Q_2$

$$TR = 300\left(Q_1 + Q_2\right) - 3\left(Q_1 + Q_2\right)^2$$

The profit function is

$$\pi = 300\left(Q_1 + Q_2\right) - 3\left(Q_1 + Q_2\right)^2 - 10Q_1 - Q_2^2$$

The FOC's:

$$\begin{aligned} \pi_1 &= 290 - 6Q_1 - 6Q_2 = 0 \\ \pi_2 &= 300 - 6Q_1 - 8Q_2 = 0 \end{aligned}$$

To solve by subtraction, re-write as

$$\begin{aligned} 300 &= 6Q_1 + 8Q_2 \\ \underline{290} &= \underline{6Q_1 + 6Q_2} \\ 10 &= 0 + 2Q_2 \\ Q_2 &= 5 \end{aligned}$$

and, therefore, $Q_1 = 43.33$, which (according to the question) should be rounded to $Q_1 = 43$