Exercise 1

\[ C(Q) = 10 + 2Q + 0.5Q^2 \]

a.

\[ MC(Q) = \frac{dC(Q)}{dQ} = 2 + Q \]

\[ AC(Q) = \frac{10 + 2Q + 0.5Q^2}{Q} = \frac{10}{Q} + 2 + \frac{1}{2}Q \]

and

\[ p = MC \]
\[ 35 = 2 + Q \]
\[ Q^* = 33 \]

b. \( p = \$35 \)

c. \[ \Pi = pQ^* - C(Q^*) \]
\[ \Pi = 35 \times 33 - (10 + 2 \times 33 + 0.5 \times (33)^2) \]
\[ \Pi = 534.5 > 0 \]

d. In the long run firms will enter the market until \( \Pi = 0 \).

Exercise 2

\[ \max_{Q} \{ P(Q)Q - C(Q) \} \]
\[ \max_{Q} \{ (100 - 2Q)Q - (640 + 20Q) \} \]

\[ \text{FOC} : \quad 100 - 4Q - 20 = 0 \]
\[ Q^m = 20 \text{ units} \]
\[ P^m = 60 \]
\[ \Pi^m = 60 \times 20 - (640 + 20 \times 20) = 160 > 0 \]

+ graphs

Exercise 3: Before the merger, \( HHI_{before} = 10000((\frac{35}{100})^2 + (\frac{25}{100})^2 + 4(\frac{10}{100})^2) = 2250 \). After the merger, the \( HHI \) increases at \( HHI_{after} = 10000((\frac{35}{100})^2 + (\frac{25}{100})^2 + (\frac{20}{100})^2 + 2(\frac{10}{100})^2) = 2450 \). The merger is likely to be challenge because (i) the original \( HHI_{before} = 2250 \) is greater than that in the Guidelines \((1,800)\) and (ii) the new \( HHI, HHI_{after} \) increases by 200, which is greater than in the guidelines \((100)\).