Chapter 9, Exercise 8

(a) The price without imports or exports is given by $Q^S = Q^D \Leftrightarrow (2/3)P = 40 - 2p \Leftrightarrow P^* = 15$.

The world market price is $P^W = 9$, the tariff $T = 9$, therefore the price of imported goods is $P^W + T = 18$. Since the price of imported goods is higher than the domestic equilibrium price ($P^W + T > P^*$), there will be no imports from the world market. Since the price domestic producers get in the domestic market are higher than the world market price ($P^* > P^W$), there will be no exports either.

$\Rightarrow$ The domestic price is $P^* = 15$.

(b) If there were neither tariffs nor import quotas, domestic production would be $Q^S = (2/3)P^W = 9$ and domestic demand would be $Q^D = 40 - 2p^2 = 22$. Imports $Q^D - Q^S = 13$ would be greater than the import quota $Q^I = 8$. Hence, the import quota is binding.

The domestic market equilibrium is given by $Q^S + Q^I = Q^D \Leftrightarrow (2/3)p + 8 = 40 - 2p \Leftrightarrow p^* = 12$.

$\Rightarrow$ The domestic price is $p^* = 12$.

Chapter 10, Exercise 4

(a) Marginal cost is $MC = 60$, marginal revenue is $MR = [(120 - 0.02Q)Q]' = 120 - 0.04Q$. The profit maximizing quantity is given by $MR = MC \Leftrightarrow 120 - 0.04Q = 60 \Leftrightarrow Q^* = 1500$. The profit maximizing price is given by $P(Q^*) = 90$, profits are $P^*Q^* - C(Q^*) = 42500$.

(b) With a tax of $t = 0.14$, the cost function becomes $C = 60.14Q + 25000$, the marginal cost becomes $MC = 60.14$. Profit maximization is then given by $MR = MC \Leftrightarrow 120 - 0.04Q = 60.14 \Leftrightarrow Q^* = 1496.50$. The profit maximizing price is $P(Q^*) = 90.07$, profits are $P^*Q^* - C(Q^*) = 19790.20$.

Chapter 10, Exercise 15

(a) Marginal cost is $MC = 2Q - 5$, marginal revenue is $MR = 55 - 4Q$, the profit maximizing quantity Q^M is given by $MR = MC \Leftrightarrow 55 - 4Q = 2Q - 5 \Leftrightarrow Q^M = 10$. This implies the profit maximizing price $P^M = P(Q^M) = 35$, profits $\pi^M = P^M Q^M - C(Q^M) = 200$. The consumer surplus is $CS^M = \int_0^{Q^M} (P(Q) - P^M)dQ = \int_0^{10} (55 - 2Q - 35)dQ = 100$. (Instead of computing the integral, one can also draw the demand curve and compute the area of the triangle which represents the consumer surplus.)

(a) Under perfect competition, we would have $P = MC \Leftrightarrow 55 - 2Q = 2Q - 5$ $\Leftrightarrow Q^C = 15$. This implies the competitive price $P^C = P(Q^C) = 25$. The consumer surplus is $CS^C = \int_0^{Q^C}(P(Q) - P^C)dQ = 225$. The profits are $\pi^C = P^C Q^C - C(Q^C) = 125$.

(c) The deadweight loss of monopoly is the difference between the total surplus under competition and the total surplus under monopoly: $\pi^C + CS^C - (\pi^M + CS^M) = 50$.

(d) The maximum price $p_1 = 27$ is between the monopoly price $p^M = 35$ and the competitive price $P^C = 25$. Therefore, the monopolist sets the price $p_1 = 27$. Quantity is given by $p_1 = P(Q) = 55 - 2Q \Leftrightarrow Q_2 = 14$. Consumer surplus is $CS_1 = \int_0^{Q_1}(P(Q) - P_1)dQ = 196$. Profits are $\pi_1 = p_1 Q_1 - C(Q_1) = 152$. The deadweight loss is $\pi^C + CS^C - (\pi_1 + CS_1) = 2$.

(e) The maximum price is $p_2 = 23$. Demand for this price is given by $p_2 = 55 - 2Q_2 \Leftrightarrow Q_2^D = 16$. Supply is given by $p_2 = MC = 2Q - 5 \Leftrightarrow Q_2^S = 14$. There is excess demand ($Q_2^D > Q_2^S$), so the produced quantity will be $Q_2 = Q_2^S = 14$. The price is $p_2 = 23$. The consumer surplus is $CS_2 = \int_0^{Q_2}(P(Q) - P_2)dQ = 252$. Profits are $\pi_2 = P_2 Q_2 - C(Q_2) = 96$. The deadweight loss is $\pi^C + CS^C - (\pi_2 + CS_2) = 2$.

(f) The average costs are minimal at $AC = MC \Leftrightarrow (100 - 5Q + Q^2)/Q = 2Q - 5$ $\Leftrightarrow Q^2 = 100$. There are two solutions to the equation $Q^2 = 100$: -10 and 10. The negative solution does not matter, so the quantity with the minimal average cost is $Q = 10$. The average cost at this quantity is $AC(Q = 10) = 15$. The regulated price $p_3 = 12$ is below the minimal average cost 15, so the firm will go out of business. Profits and consumer surplus are both zero $\pi_3 = CS_3 = 0$. The deadweight loss is $\pi^C + CS^C - (\pi_3 + CS_3) = 350$.