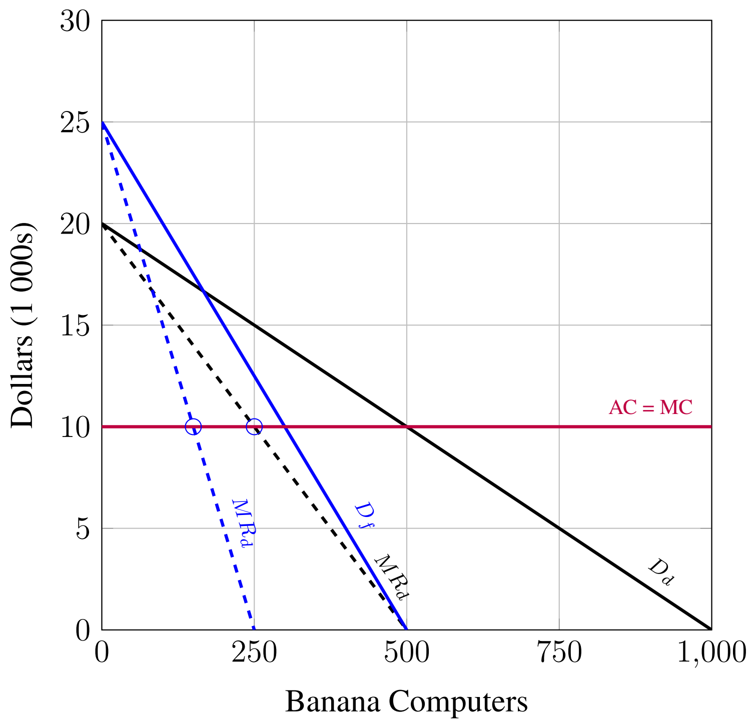
Banana Computer Company sells Banana computers in both the domestic and foreign markets. Because of differences in the power supplies, a Banana purchased in one market cannot be used in the other market. The demand and marginal revenue curves associated with the two markets are as follows:

$$P_d = 20\,000 - 20Q_d \qquad P_f = 25\,000 - 50Q_f$$
$$MR_d = 20\,000 - 40Q_d \quad MR_f = 25\,000 - 100Q_f.$$

Banana's production process exhibits constant returns to scale and it takes \$1 000 000 to produce 100 computers.

(a) Banana's long-run average cost function is $AC(Q) = \frac{\$1\,000\,000}{100} = \$10\,000$ and its long-run marginal cost function is $MC(Q) = \frac{dC(Q)}{dQ} = \frac{d\$10\,000Q}{dQ} = \$10\,000$. (Hint: If there are constant returns to scale, does long-run average cost change as output changes?) Draw the average and marginal cost curves on the graph.

(b) Draw the demand curve for the domestic market and the marginal revenue curve for the domestic market in black ink. Draw the demand curve for the foreign market and the marginal revenue curve for the foreign market in blue ink.



(c) If Banana is maximizing its profits, it will sell 250 in the domestic market at 15 000 dollars each and 150 computers in the foreign market at 17500 dollars each. What are Banana's total profits? \$2 375 000.

Justification:

$$\begin{aligned} MR_d &= MC_d \\ 20\,000 - 40Q_d &= 10\,000 \\ Q_d^* &= 250 \end{aligned} \qquad \begin{aligned} MR_F &= MC_f \\ 25\,000 - 100Q_f &= 10\,000 \\ Q_f^* &= 150 \end{aligned}$$

$$\begin{aligned} P_d^* &= 20\,000 - 40Q_d^* = \\ &= 20\,000 - 40 \cdot 250 = 15\,000 \end{aligned} \qquad \begin{aligned} P_f^* &= 25\,000 - 100Q_f^* = \\ &= 25\,000 - 100 \cdot 150 = 17\,500 \end{aligned}$$

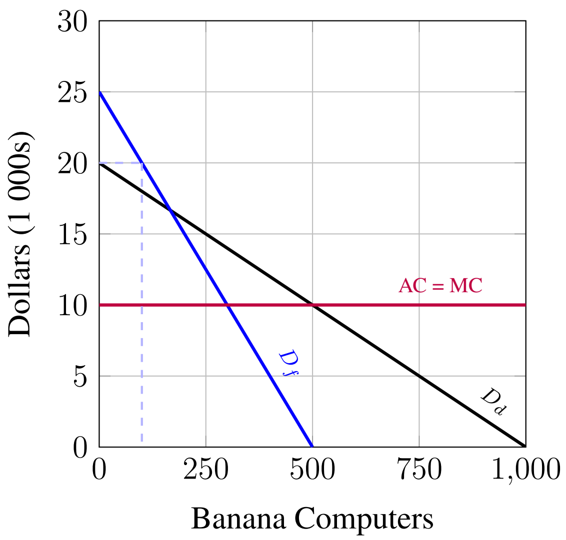
$$\Pi^* = \Pi_d^* + \Pi_f^* = (P_d^* - AC(Q_d^*)) \cdot Q_d^* + \left(P_f^* - AC(Q_f^*)\right) \cdot Q_f^* =$$
$$= (15\,000 - 10\,000) \cdot 250 + (17\,500 - 10\,000) \cdot 150 = 2\,375\,000$$

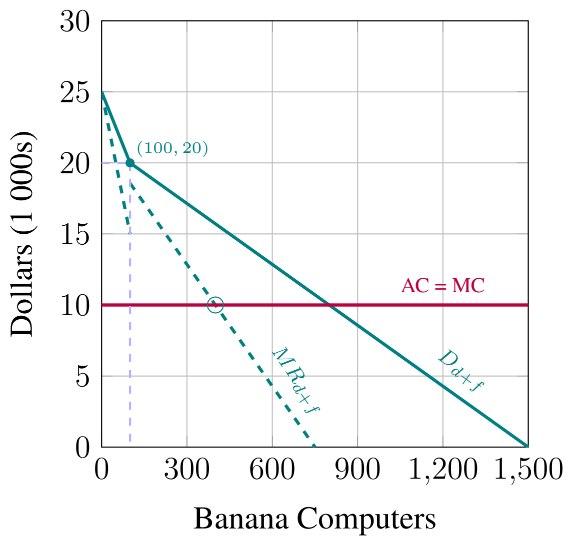
(d) At the profit-maximizing price and quantity, what is the price elasticity of demand in the domestic market? -3. What is the price elasticity of demand in the foreign market? -2.33. Is demand more or less elastic in the market where the higher price is charged? Less elastic.

Justification:

$$P_d^* \cdot \left(1 - \frac{1}{|\epsilon_d^*|}\right) = MC_d^* \qquad P_f^* \cdot \left(1 - \frac{1}{|\epsilon_f^*|}\right) = MC_f^*$$
$$15\,000 \cdot \left(1 - \frac{1}{|\epsilon_d^*|}\right) = 10\,000 \quad 17\,500 \cdot \left(1 - \frac{1}{|\epsilon_f^*|}\right) = 10\,000$$
$$|\epsilon_d^*| = 3 \qquad |\epsilon_f^*| = 2.33$$

(e) Suppose that somebody figures out a wiring trick that allows a Banana computer built for either market to be costlessly converted to work in the other. (Ignore transportation costs.) On the graph below, draw the new inverse demand curve and marginal revenue curve with green ink facing Banana.





Justification:

$$P_d = 20\,000 - 20Q_d \quad \rightarrow Q_d = 1\,000 - \frac{1}{20}P_d$$
$$P_f = 25\,000 - 50Q_f \quad \rightarrow Q_f = 500 - \frac{1}{50}P_f$$

$$Q_{d+f}(P) = \begin{cases} Q_f(P) & \text{if } P > 20\,000 \\ Q_d(P) + Q_f(P) & \text{if } P \leq 20\,000 \end{cases} =$$
$$= \begin{cases} 500 - \frac{1}{50}P & \text{if } P > 20\,000 \\ (500 - \frac{1}{50}P) + (1\,000 - \frac{1}{20}P) & \text{if } P \leq 20\,000 \end{cases} =$$
$$= \begin{cases} 500 - \frac{1}{50}P & \text{if } P > 20\,000 \\ 1\,500 - \frac{7}{100}P & \text{if } P \leq 20\,000 \end{cases}$$

$$P(Q_{d+f}) = \begin{cases} 25\,000 - 50Q_{d+f} & \text{if } Q_{d+f} < 100 \\ \frac{150\,000}{7} - \frac{100}{7}Q_{d+f} & \text{if } Q_{d+f} \geq 100 \end{cases}$$
$$MR_{d+f}(Q_{d+f}) = \begin{cases} 25\,000 - 100Q_{d+f} & \text{if } Q_{d+f} < 100 \\ \frac{150\,000}{7} - \frac{200}{7}Q_{d+f} & \text{if } Q_{d+f} \geq 100 \end{cases}$$

(f) Given that costs haven't changed, how many Banana computers should Banana sell? 400. What price will it charge? $\$15\,714$. How will Banana's profits change now that it can no longer practice price discrimination? Decrease by $\$89\,286$.

Justification:

$$MR_{d+f}(Q_{d+f}) = MC(Q_{d+f})$$
$$\begin{cases} 25\,000 - 100Q_{d+f} & \text{if } Q_{d+f} < 100 \\ \frac{150\,000}{7} - \frac{200}{7}Q_{d+f} & \text{if } Q_{d+f} \geq 100 \end{cases} = 10\,000$$

$$25\,000 - 100Q_{d+f} = 10\,000 \quad \rightarrow Q_{d+f} = 150 > 100 \rightarrow \text{not a solution}$$
$$\frac{150\,000}{7} - \frac{200}{7}Q_{d+f} = 10\,000 \quad \rightarrow Q^*_{d+f} = 400 \geq 100 \rightarrow \text{solution}$$

$$P^* = P(Q^*_{d+f}) = \frac{150\,000}{7} - \frac{100}{7}Q^*_{d+f} \quad \leftarrow \text{because } Q^*_{d+f} = 400 \geq 100$$
$$P^* = \frac{110\,000}{7} \approx 15\,714$$

$$\Pi^* = \left(P^* - AC(Q^*_{d+f})\right) \cdot Q^*_{d+f} = (15\,714 - 10\,000) \cdot 400 = 2\,285\,714$$
$$\Delta\Pi^* = 2\,285\,714 - 2\,375\,000 = -89\,286$$