

Problem Definition

Problem 45. **Profit** A sporting goods manufacturer produces regulation soccer balls at two plants. The costs of producing x_1 units at location 1 and x_2 units at location 2 are given by

$$C_1(x_1) = 0.02x_1^2 + 4x_1 + 500$$

and

$$C_2(x_2) = 0.05x_2^2 + 4x_2 + 275$$

respectively. If the product sells for \$45 per unit, then the profit function for the product is given by

$$P(x_1, x_2) = 45(x_1 + x_2) - C_1(x_1) - C_2(x_2).$$

Find (a) $P(250, 150)$ and (b) $P(300, 300)$.

Solution Step 1:

The evaluation for $P(250, 150)$ is

$$P(250, 150) = 45(250 + 150) - C_1(250) - C_2(150).$$

To finish this off we need

$$C_1(250) = 0.02(250)^2 + 4(250) + 500 = 2750$$

and

$$C_2(150) = 0.05(150)^2 + 4(150) + 275 = 2000$$

So,

$$P(250, 150) = 45(250 + 150) - 2750 - 2000 = 45(250 + 150) - 2750 - 2000 = 13250$$

The profit for this setup is \$13,250.

Solution Step 2:

The evaluation for $P(300, 200)$ is

$$P(300, 200) = 45(300 + 200) - C_1(300) - C_2(200).$$

To finish this off we need

$$C_1(300) = 0.02(300)^2 + 4(300) + 500 = 3500$$

and

$$C_2(200) = 0.05(200)^2 + 4(200) + 275 = 3075$$

So,

$$P(300, 200) = 45(500) - 3500 - 3075 = 15925$$

The profit for this setup is \$15,925.