

Question 1

A company's revenue (in dollars) from selling x items is given by:

$$R(x) = 50x - 0.2x^2$$

and the cost (in dollars) to produce x items is:

$$C(x) = 10x + 100$$

- (a) Find the profit function $P(x)$.
- (b) Find the number of items that maximizes profit.
- (c) What is the maximum profit?

Question 1 - Solution

(a) Profit is revenue minus cost:

$$P(x) = R(x) - C(x) = (50x - 0.2x^2) - (10x + 100) = 40x - 0.2x^2 - 100$$

(b) Maximize $P(x) = -0.2x^2 + 40x - 100$.

This is a downward-opening parabola. The maximum occurs at:

$$x = \frac{-b}{2a} = \frac{-40}{2(-0.2)} = \frac{-40}{-0.4} = \boxed{100}$$

(c) Maximum profit:

$$P(100) = 40(100) - 0.2(100)^2 - 100 = 4000 - 2000 - 100 = \boxed{1900}$$

Answer:

Max profit occurs at $x = 100$ items and the maximum profit is \$1900.