

Answer on Question #55152 – Math – Algebra

The International Silver Strings Submarine Band holds a bake sale each year to fund their trip to the National Sasquatch Convention. It has been determined that the cost in dollars of baking x cookies is

$$C(x) = 0.5x + 19 \text{ (cost function)}$$

and that the demand function for their cookies is

$$p = 12 - 0.05x.$$

How many cookies should they bake in order to maximize their profit?

Solution

The corresponding profit function is given by

$$P(x) = R(x) - C(x),$$

where

$$R(x) = px = (12 - 0.05x)x = 12x - 0.05x^2.$$

Then we need to find the maximum of function

$$P(x) = 12x - 0.05x^2 - 0.5x - 19 = 11.5x - 0.05x^2 - 19.$$

Set the derivative of $P(x)$ equal to zero:

$$\begin{aligned} P'(x) &= 11.5 - 0.1x = 0, \\ x &= 115. \end{aligned}$$

The second derivative of $P(x)$ is equal to

$$P''(x) = -0.1 < 0.$$

If

$$x = 115,$$

then the profit

$$P(115) = 11.5 \cdot 115 - 0.05 \cdot 115^2 - 19 = 642.25 \text{ (dollars)}$$

will be maximal.

Answer: the International Silver Strings Submarine Band must bake 115 cookies.