

### Answer on Question #47986 – Math - Calculus

A price  $p$  (in dollars) and demand  $x$  for a product are related by

$$2x^2 + 7xp + 50p^2 = 21600.$$

If the price is increasing at a rate of 2 dollars per month when the price is 20 dollars, find the rate of change of the demand.

Rate of change of demand =

**Solution.**

$$2x^2 + 7xp + 50p^2 = 21600.$$

$$\text{If } p = 20, \text{ then } 2x^2 + 140x + 20000 = 21600 \rightarrow x^2 + 70x - 800 = 0 \rightarrow \\ \rightarrow x = -80 \text{ or } x = 10.$$

The value we select has to be greater than 0, so  $x = 10$ .

Now, take the derivative of  $2x^2 + 7xp + 50p^2 = 21600$ .

$$\frac{d}{dt}(2x^2 + 7xp + 50p^2) = \frac{d}{dt}(21600).$$

$$4xx' + 7x'p + 7xp' + 100pp' = 0 \rightarrow x' = -\frac{(7x+100p)p'}{4x+7p}.$$

$$\text{When } p = 20, p' = 2, x = 10, x' = -\frac{(70+2000)2}{40+140} = -\frac{4140}{180} = -\frac{212}{9} \approx -23.56.$$

Rate of change of demand  $\approx -23.56$ .