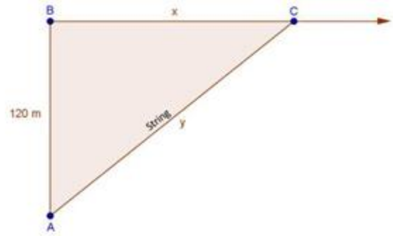
Derivatives as a Rate Measurer Ex 13.2 Q25



Let C be the position of kite and AC be the string.

Here, $y^2 = x^2 + (120)^2$ ---(i)

$$2y\frac{dy}{dt} = 2x\frac{dx}{dt}$$

$$y\frac{dy}{dt} = x\frac{dx}{dt}$$

$$\frac{dy}{dt} = \frac{x}{y}(52) \quad \text{---(ii)} \qquad \left[\because \frac{dx}{dt} = 52 \text{ m/sec}\right]$$

From equation (i),

$$y^2 = x^2 + (120)^2$$

$$(130)^2 = x^2 + (120)^2$$

$$x^2 = 16900 - 14400$$

$$x^2 = 2500$$

$$x = 50$$

Using equation (ii),

$$\frac{dy}{dt} = \frac{x}{y}(52)$$

$$= \frac{50}{130}(52)$$

$$= 20 \text{ m/sec}$$

So, string is being paid out at the rate of 20 m/sec.

Derivatives as a Rate Measurer Ex 13.2 Q26

Here,

$$\frac{dy}{dt} = 2\frac{dx}{dt} \qquad \text{---(i)}$$

and $\quad y = \left(\frac{2}{3}\right)x^3 + 1$

$$\frac{dy}{dt} = \frac{2}{3} \times 3x^2 \frac{dx}{dt}$$

$$2\frac{dx}{dt} = 2x^2 \frac{dx}{dt} \qquad \left[\text{Using equation (i)}\right]$$

$$2 = 2x^2$$

$\Rightarrow \quad x = \pm 1$

$$y = \left(\frac{2}{3}\right)x^3 + 1$$

Put $x = 1, \quad y = \frac{2}{3} + 1 = \frac{5}{3}$

Put $x = -1, \quad y = \frac{2}{3}(-1) + 1 = \frac{1}{3}$

So, required point $\left(1, \frac{5}{3}\right)$ and $\left(-1, \frac{1}{3}\right)$.

Derivatives as a Rate Measurer Ex 13.2 Q27

Here,

$$\frac{dx}{dt} = \frac{dy}{dt} \qquad \text{---(i)}$$

and $\quad$ curve is

$$y^2 = 8x$$

$$2y\frac{dy}{dt} = 8\frac{dx}{dt}$$

$$2y = 8 \qquad \left[\text{using equation (i)}\right]$$

$$y = 4$$

$\Rightarrow \quad (4)^2 = 8x$

$\Rightarrow \quad x = 2$

So, required point $= (2, 4)$.

*********** END **********