Derivatives as a Rate Measurer Ex 13.2 Q13

Here, curve is

$$y = x^2 + 2x$$

And $\quad \dfrac{dy}{dt} = \dfrac{dx}{dt} \qquad \text{---(i)}$

$$y = x^2 + 2x$$

$$\Rightarrow \quad \frac{dy}{dt} = 2x\frac{dx}{dt} + 2\frac{dx}{dt}$$

$$\Rightarrow \quad \frac{dy}{dt} = \frac{dx}{dt}(2x + 2)$$

Using equation (i),

$$2x + 2 = 1$$

$$2x = -1$$

$$x = -\frac{1}{2}$$

So, $\quad y = x^2 + 2x$

$$= \left(-\frac{1}{2}\right)^2 + 2\left(-\frac{1}{2}\right)$$

$$= \frac{1}{4} - 1$$

$$y = -\frac{3}{4}$$

So, required points is $\left(-\dfrac{1}{2}, -\dfrac{3}{4}\right)$.

Derivatives as a Rate Measurer Ex 13.2 Q14

Here,

$$\frac{dx}{dt} = 4 \text{ units/sec, and } x = 2$$

And, $y = 7x - x^3$

Slope of the curve $(S) = \frac{dy}{dx}$

$$S = 7 - 3x^2$$

$$\frac{ds}{dt} = -6x\frac{dx}{dt}$$

$$= -6(2)(4)$$

$$= -48 \text{ units/sec}$$

So, slope is decreasing at the rate of 48 units/sec.

Derivatives as a Rate Measurer Ex 13.2 Q15

Here,

$$\frac{dy}{dt} = 3\frac{dx}{dt} \qquad ---(i)$$

And, $y = x^3$

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

$$3\frac{dx}{dt} = 3x^2\frac{dx}{dt} \qquad [\text{Using equation (i)}]$$

$$3x^2 = 3$$

$$x^2 = 1$$

$$x = \pm 1$$

Put $x = 1 \Rightarrow y = (1)^3 = 1$

Put $x = -1 \Rightarrow y = (-1)^3 = -13$

So, the required points are $(1,1)$ and $(-1,-1)$.

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