

**Question 02.** Find maximum or minimum values of the function

(a)  $y = 25x^2 + 5 - 10x$

(b)  $y = 9 - (x - 3)^2$

**Solution** (a) For maximum and minimum value, we can put  $\frac{dy}{dx} = 0$ .

or  $\frac{dy}{dx} = 50x - 10 = 0$

$\therefore x = \frac{1}{5}$

Further,  $\frac{d^2y}{dx^2} = 50$

or  $\frac{d^2y}{dx^2}$  has positive value at  $x = \frac{1}{5}$ . Therefore,  $y$  has minimum value at  $x =$

Substituting  $x = \frac{1}{5}$  in given equation, we get

$$y_{\min} = 25\left(\frac{1}{5}\right)^2 + 5 - 10\left(\frac{1}{5}\right) = 4$$

(b)  $y = 9 - (x - 3)^2 = 9 - x^2 - 9 + 6x$

or  $y = 6x - x^2$

$\therefore \frac{dy}{dx} = 6 - 2x$

For minimum or maximum value of  $y$  we will substitute  $\frac{dy}{dx} = 0$

or  $6 - 2x = 0$  or  $x = 3$

To check whether value of  $y$  is maximum or minimum at  $x = 3$  we will have to check whether  $\frac{d^2y}{dx^2}$  is positive or negative.

$$\frac{d^2y}{dx^2} = -2$$

or  $\frac{d^2y}{dx^2}$  is negative at  $x = 3$ . Hence, value of  $y$  is maximum. This maximum value of  $y$  is,

$$y_{\max} = 9 - (3 - 3)^2 = 9$$