

1. The normal at the point  $(bt_1^2, 2bt_1)$  on a parabola meets the parabola again in the point  $(bt_2^2, 2bt_2)$ , then

(a)  $t_2 = t_1 + \frac{2}{t_1}$                       (b)  $t_2 = -t_1 - \frac{2}{t_1}$                       [2003]

(c)  $t_2 = -t_1 + \frac{2}{t_1}$                       (d)  $t_2 = t_1 - \frac{2}{t_1}$

Solution: -

1. (b) Equation of the normal to a parabola  $y^2 = 4bx$  at point  $(bt_1^2, 2bt_1)$  is  $y = -t_1x + 2bt_1 + bt_1^3$

As given, it also passes through  $(bt_2^2, 2bt_2)$  then

$$2bt_2 = -t_1 bt_2^2 + 2bt_1 + bt_1^3$$

$$2t_2 - 2t_1 = -t_1(t_2^2 - t_1^2) = -t_1(t_2 + t_1)(t_2 - t_1)$$

$$\Rightarrow 2 = -t_1(t_2 + t_1) \Rightarrow t_2 + t_1 = -\frac{2}{t_1}$$

$$\Rightarrow t_2 = -t_1 - \frac{2}{t_1}$$