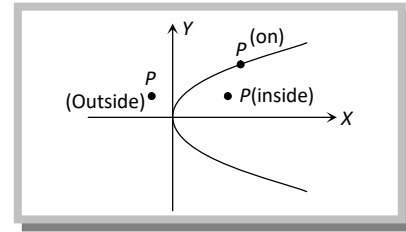


Position of a point and a Line with respect to a Parabola.

(1) **Position of a point with respect to a parabola:** The point $P(x_1, y_1)$ lies outside on or inside the parabola $y^2 = 4ax$ according as $y_1^2 - 4ax_1 >, =, \text{ or } < 0$



(2) **Intersection of a line and a parabola:** Let the parabola be $y^2 = 4ax$ (i)

And the given line be $y = mx + c$ (ii)

Eliminating y from (i) and (ii) then $(mx + c)^2 = 4ax$ or $m^2x^2 + 2x(mc - 2a) + c^2 = 0$ (iii)

This equation being quadratic in x , gives two values of x . It shows that every straight line will cut the parabola in two points, may be real, coincident or imaginary, according as discriminate of (iii) $>, = \text{ or } < 0$

\therefore The line $y = mx + c$ does not intersect, touches or intersect a parabola $y^2 = 4ax$, according as

$$c >, =, < \frac{a}{m}$$