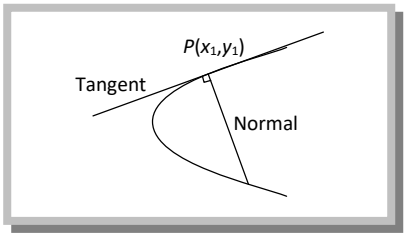
Equations of Normal in Different forms.

(1) **Point form:**The equation of the normal to the parabola $y^2 = 4ax$ at a point (x_1, y_1) is

$$y - y_1 = -\frac{y_1}{2a}(x - x_1)$$



Equation of normals of all other standard parabolas at (x_1, y_1)	
Equation of parabolas	**Normal at (x_1, y_1)**
$y^2 = -4ax$	$y - y_1 = \frac{y_1}{2a}(x - x_1)$
$x^2 = 4ay$	$y - y_1 = -\frac{2a}{x_1}(x - x_1)$
$x^2 = -4ay$	$y - y_1 = \frac{2a}{x_1}(x - x_1)$

(2) **Parametric form**: The equation of the normal to the parabola $y^2 = 4ax$ at $(at^2, 2at)$ is

$$y + tx = 2at + at^3$$

Equations of normal of all other standard parabola at 't'		
Equations of parabolas	**Parametric co-ordinates**	**Normals at 't'**
$y^2 = -4ax$	$(-at^2, 2at)$	$y - tx = 2at + at^3$
$x^2 = 4ay$	$(2at, at^2)$	$x + ty = 2at + at^3$
$x^2 = -4ay$	$(2at, -at^2)$	$x - ty = 2at + at^3$

(3) **Slope form:** The equation of normal of slope m to the parabola $y^2 = 4ax$ is $y = mx - 2am - am^3$ at the point $(am^2, -2am)$.

Equations of normal, point of contact, and condition of normality in terms of slope (m)			
Equations of parabola	**Point of contact in terms of slope (m)**	**Equations of normal in terms of slope (m)**	**Condition of normality**
$y^2 = 4ax$	$(am^2, -2am)$	$y = mx - 2am - am^3$	$c = -2am - am^3$
$y^2 = -4ax$	$(-am^2, 2am)$	$y = mx + 2am + am^3$	$c = 2am + am^3$
$x^2 = 4ay$	$\left(-\frac{2a}{m}, \frac{a}{m^2}\right)$	$y = mx + 2a + \frac{a}{m^2}$	$c = 2a + \frac{a}{m^2}$
$x^2 = -4ay$	$\left(\frac{2a}{m}, -\frac{a}{m^2}\right)$	$y = mx - 2a - \frac{a}{m^2}$	$c = -2a - \frac{a}{m^2}$

Note: The line $lx + my + n = 0$ is a normal to the parabola $y^2 = 4ax$ if $al(l^2 + 2m^2) + m^2 n = 0$