9. Find the eqn of tangent to the parabola $y = x^2 + x + 1$ at $(0, 1)$.

Solution:

Eqn of parabola is;
$$y = x^2 + x + 1 \quad \cdots \quad (i)$$

Since the point $P(0, 1)$ lies in the parabola.

$$y = x^2 + x + 1$$
$$\frac{dy}{dx} = 2x + 1$$
$$\therefore m = 2x + 1 \quad \cdots$$

The eqn passes through point of contact $(0, 1)$ is.

$$(y - 1) = m(x - 0)$$
or, $y - 1 = (2x + 1)(x)$
or, $y - 1 = 2x^2 + x$

Since, the parabola & tangent pass through $(0, 1)$,

$$m = 2.0 + 1$$
$$\therefore m = 1.$$

When $m = 1$,
$$y - 1 = 1 \cdot x$$
$$\therefore x - y + 1 = 0.$$

$\therefore x - y + 1 = 0$ is the req. eqn of tangent.