Question

Let y=x^3 be a curve. The equation of the tangent line at the point where x=-1 is y=?

Solution

The equation of the tangent line at point $\left(x_0, y(x_0)\right)$ is

$$y - y(x_0) = y'(x_0)(x - x_0)$$

We have:

$x_0 = -1, y(x_0) = (-1)^3 = -1,$

$y'(x) = 3x^2$, from which $y'(x_0) = 3 \cdot (-1)^2 = 3.$

Then the equation is

$$y - (-1) = 3\big(x - (-1)\big)$$

or

$$y = 3x + 2$$

Answer: $y = 3x + 2.$