

## Exercise 58

Find an equation of the tangent line to the curve  $y = x^4 + 1$  that is parallel to the line  $32x - y = 15$ .

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### Solution

Writing the given equation of the line as

$$y = 32x - 15,$$

we see that it has a slope of 32. The aim is to take the derivative of the given function and find where it's equal to 32.

$$\begin{aligned}y' &= \frac{d}{dx}(x^4 + 1) \\&= \frac{d}{dx}(x^4) + \frac{d}{dx}(1) \\&= (4x^3) + (0) \\&= 4x^3\end{aligned}$$

Set this equal to 32 and solve for  $x$ .

$$4x^3 = 32$$

$$x^3 = 8$$

$$x = 2$$

Plug this value of  $x$  into the given function to get the corresponding  $y$ -value on the curve.

$$y(2) = 2^4 + 1 = 17$$

Finally, determine the equation of the line with slope 32 that goes through the point  $(2, 17)$ .

$$y - 17 = 32(x - 2)$$