

Exercise 39

Find an equation of the tangent line to the curve at the given point. Illustrate by graphing the curve and the tangent line on the same screen.

$$y = 3x^2 - x^3, \quad (1, 2)$$

Solution

Since we have a point on the line, we just need to find the line's slope. The aim, then, is to take the derivative of the given function and evaluate it at the given x -coordinate.

$$\begin{aligned} y' &= \frac{d}{dx}(3x^2 - x^3) \\ &= 3\frac{d}{dx}(x^2) - \frac{d}{dx}(x^3) \\ &= 3(2x) - (3x^2) \\ &= 6x - 3x^2 \end{aligned}$$

Evaluate it at $x = 1$.

$$y'(1) = 3$$

Therefore, the equation of the tangent line to $y = 3x^2 - x^3$ at $(1, 2)$ is

$$y - 2 = 3(x - 1).$$

