

Exercise 32

Find the critical numbers of the function.

$$f(x) = 2x^3 + x^2 + 2x$$

Solution

A critical number is a value of x for which the derivative is zero or nonexistent. Take the derivative of the function.

$$\begin{aligned} f'(x) &= \frac{d}{dx}(2x^3 + x^2 + 2x) \\ &= 2(3x^2) + (2x) + 2(1) \\ &= 6x^2 + 2x + 2 \end{aligned}$$

Set $f'(x) = 0$ and solve for x .

$$\begin{aligned} f'(x) &= 0 \\ 6x^2 + 2x + 2 &= 0 \\ 2(3x^2 + x + 1) &= 0 \\ 3x^2 + x + 1 &= 0 \\ x &= \frac{-1 \pm \sqrt{(-1)^2 - 4(3)(1)}}{2(3)} \\ x &= \frac{-1 \pm \sqrt{-11}}{6} \\ x &= \frac{-1 \pm i\sqrt{11}}{6} \end{aligned}$$

There are no real values of x that satisfy $f'(x) = 0$, so there are no critical numbers of $f(x)$.