

Exercise 33

Find the critical numbers of the function.

$$g(t) = t^4 + t^3 + t^2 + 1$$

Solution

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

$$\begin{aligned}g'(t) &= \frac{d}{dt}(t^4 + t^3 + t^2 + 1) \\&= (4t^3) + (3t^2) + (2t) + (0) \\&= 4t^3 + 3t^2 + 2t\end{aligned}$$

Set $g'(t) = 0$ and solve for t .

$$\begin{aligned}g'(t) &= 0 \\4t^3 + 3t^2 + 2t &= 0 \\t(4t^2 + 3t + 2) &= 0 \\t = 0 \quad \text{or} \quad t &= \frac{-3 \pm \sqrt{(-3)^2 - 4(4)(2)}}{2(4)} \\t = 0 \quad \text{or} \quad t &= \frac{-3 \pm \sqrt{-23}}{8} \\t = 0 \quad \text{or} \quad t &= \frac{-3 \pm i\sqrt{23}}{8}\end{aligned}$$

Only real values can be critical numbers of the function, so

$$t = 0.$$