

1 2.5: Continuity

Definitions:

f is **continuous** at $x = a$

Removable Discontinuities

Source for understanding: Maplet “Left and Right Hand Limits and Continuities”, located at <http://calclab.math.tamu.edu/maple/maplets/> (NetID login)

Theorems:

Limits inside Continuous Functions

Continuity of Polynomial/Rational Functions

Intermediate Value Theorem

Examples:

$$\text{If } f(x) = \begin{cases} 1 - x & \text{if } x \geq 1 \\ -x & \text{if } x < 1 \end{cases}$$

determine whether f is continuous at $x = 1$ or not. Explain your answer precisely. Is f continuous from the left or right? Does f have a removeable discontinuity?

$$\lim_{x \rightarrow 1} \sqrt{\frac{x^2 + 2x - 3}{x - 1}} =$$

Is there a real solution to the equation $x^5 - x^2 + 2x = 6$? If so, find the value of a such there is a solution in the interval $[a, a + 1]$.

On Your Own: Determine whether the function $f(x) = \begin{cases} \frac{x^2 - 2x - 8}{x + 2} & \text{if } x \neq 2 \\ 3 & \text{if } x = 2 \end{cases}$

is continuous at $x = 2$ or not. Explain your answer precisely. Is f continuous from the left or right? Does f have a removable discontinuity?

Not continuous: the limit does not equal $f(2)$. f is not continuous from the left or right, but has a removable discontinuity.