Calculus 12
1.3 – Continuity

A function $f(x)$ is **continuous** on the interval $x \in (a, b)$ if $f(x)$ is defined for all $x \in (a, b)$.

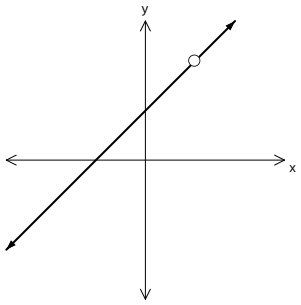
A function $f(x)$ is **discontinuous** at $x = c$ if $f(c) = u/d$ → at $x = c$ the graph of $f(x)$ has a "break."

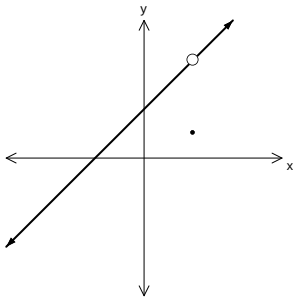
Every function is continuous over its domain.

The following functions are continuous for $x \in R$: Linear, Polynomial, Absolute Value, Sin, Cos, Exponential.

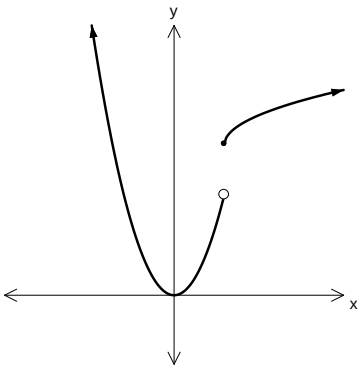
Types of Discontinuities

Point Discontinuity or *Hole*

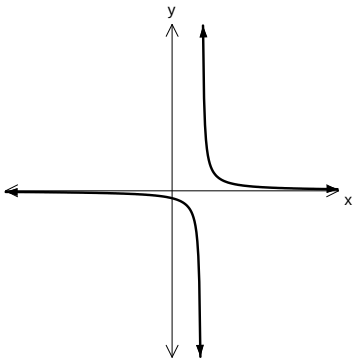




Jump Discontinuity



Asymptotic/Infinite Discontinuity



The Continuity Theorem

$f(x)$ is continuous at $x = c$ if:

I.

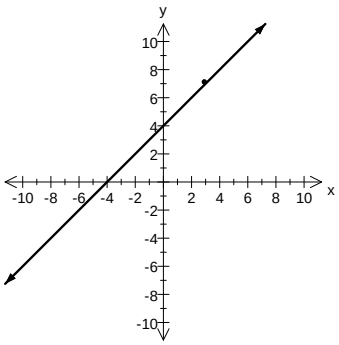
II.

III.

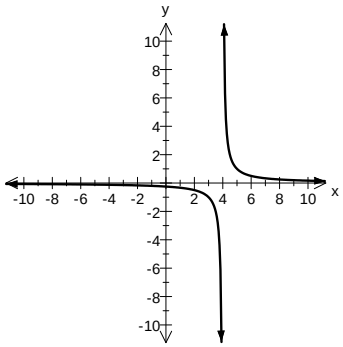
➔ If $f(x)$ is continuous at $x = c$ then _____

Examples

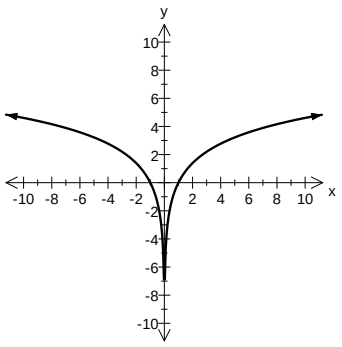
1. $\lim_{x \to 3} x + 4$



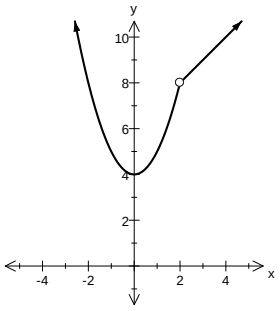
2. $\lim_{x \to 2} \frac{1}{x-4}$



3. $\lim_{x \to e} \ln(x^2)$



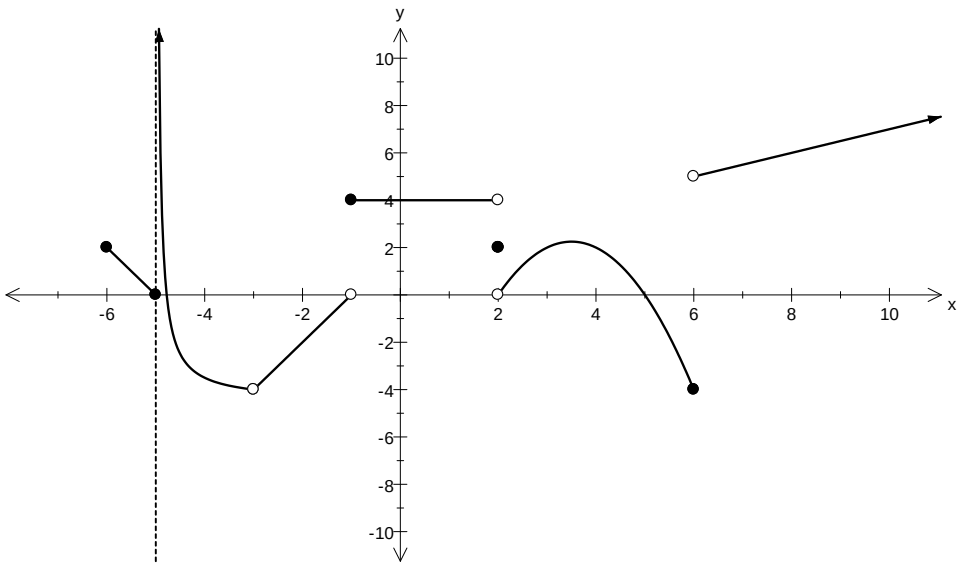
4. $f(x)=\begin{cases} x^2+4 & x\le 2 \\ x+6 & x>2 \end{cases}$ Is $f(x)$ continuous at $x=2$?



5. $f(x)=\begin{cases} 2\sin x & x\le \dfrac{3\pi}{2} \\ -1.5x+5 & x>\dfrac{3\pi}{2} \end{cases}$ Is $f(x)$ continuous at $x=\dfrac{3\pi}{2}$?

6. $f(x)=\begin{cases} x^2-m & x<e \\ \ln(x) & x\ge e \end{cases}$ Determine the value of *m* that makes $f(x)$ continuous for $x\in R$.

Intervals of Continuity



State the intervals of continuity for the function given above.

At the following values of *x*, state whether the function is *continuous from the left*, *continuous from the right*, continuous from both left and right, or neither.

x = -6 :

x = -5 :

x = -3 :

x = -1 :

x = 0 :

x = 2 :

x = 5 :

x = 6 :

x = 8 :