

Definition of Continuity

Let c be a number in the interval (a, b) , and let f be a function whose domain contains the interval (a, b) . The function f is **continuous at the point c** if the following conditions are true:

1. $f(c)$ Is defined
2. $\lim_{x \rightarrow c} f(x)$ exists
3. $\lim_{x \rightarrow c} f(x) = f(c)$

If f is continuous at every point in the interval (a, b) , then it is **continuous on an open interval (a, b)**

Continuity of Polynomial and Rational Functions

1. A polynomial function is continuous at every real number.
2. A rational function is continuous at every number in its domain.

Discuss the continuity of each function.

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

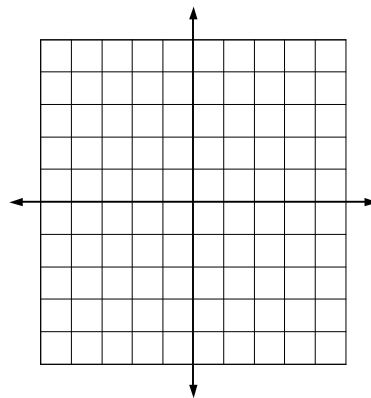
$$(b) f(x) = x^3 - x$$

Discuss the continuity of a Rational Function.

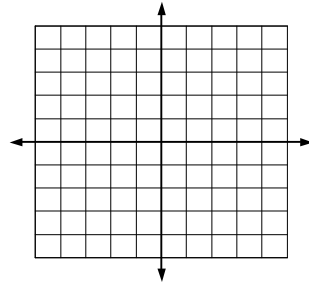
$$(a) f(x) = \frac{1}{x} \quad (b) f(x) = \frac{(x^2 - 1)}{(x - 1)} \quad (c) f(x) = \frac{1}{(x^2 + 1)}$$

Discuss the continuity of

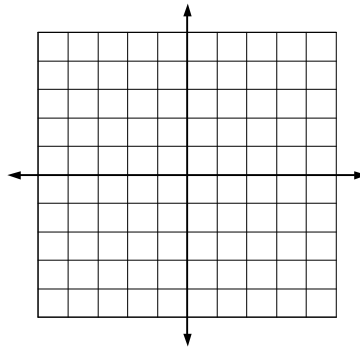
$$g(x) = \begin{cases} 5 - x & \text{if } -1 \leq x \leq 2 \\ x^2 - 1 & \text{if } 2 \leq x \leq 3 \end{cases}$$



Discuss the continuity of $g(x) = \sqrt{3-x}$



Discuss the function $f(x) = \frac{|x+1|}{x+1}$



From section 1.5

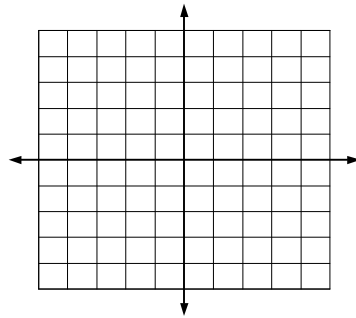
$$1) \lim_{\Delta x \rightarrow 0} \frac{4(x + \Delta x) - 5 - (4x - 5)}{\Delta x}$$

$$2) \lim_{\Delta x \rightarrow 0} \frac{\sqrt{x + \Delta x} - \sqrt{x}}{\Delta x}$$

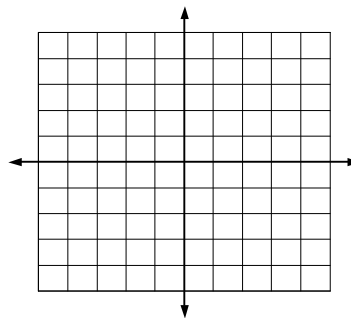
$$3) \lim_{\Delta t \rightarrow 0} \frac{(t + \Delta t)^2 - 4(t + \Delta t) + 2 - (t^2 - 4t + 2)}{\Delta t}$$

From Section 1.5

$$1) \lim_{\Delta x \rightarrow 3} \frac{|x - 3|}{x - 3}$$

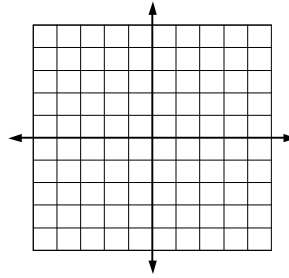


$$2) \lim_{\Delta x \rightarrow -1} \frac{x + 1}{|x + 1|}$$



From section 1.5

1) $\lim_{\Delta x \rightarrow 1} f(x)$, where $f(x) = \begin{cases} x & \text{if } x \leq 1 \\ 1-x & \text{if } x > 1 \end{cases}$



1) $\lim_{\Delta x \rightarrow 0} f(x)$, where $f(x) = \begin{cases} x^2 - 4 & \text{if } x \leq 0 \\ 3x + 1 & \text{if } x > 0 \end{cases}$

