Name _____
Date _____ Period _____

Properties of Continuity

If b is a real number and $f(x)$ and $g(x)$ are continuous at $x = c$, then the following functions are also continuous at $x = c$…

$f(x) = 2x + 4$ $g(x) = x + 8$ $x = 5$

Scalar Multiple Rule:

$b \cdot f(x)$ is continuous at $x = c$

Example:

Let $b = 3$, then $b \cdot f(x) = 3(2x + 4)$

$= 6x + 12$

is continuous at $x = 5$

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Sum and Difference Rule:

$f(x) \pm g(x)$ continuous at $x = c$

Example:

$f(x) + g(x) = 2x + 4 + x + 8$

$= 3x + 12$

is continuous at $x = 5$

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Sum and Difference Rule:

$f(x) \pm g(x)$ continuous at $x = c$

Example:

$f(x) - g(x) = 2x + 4 - (x + 8)$

$= x - 4$

is continuous at $x = 5$

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Product Rule:

$f(x) \cdot g(x)$ continuous at $x = c$

Example:

$f(x) \cdot g(x) = (2x + 4)(x + 8)$

$= 2x^2 + 20x + 32$

is continuous at $x = 5$

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Quotient Rule:

$$\frac{f(x)}{g(x)} \quad , \quad g(c) \neq 0$$

Example:

$$\frac{f(x)}{g(x)} = \frac{2x + 4}{x + 8}$$

is continuous at $x = 5$

Correlation Between a Functions Domain and Its Continuity

The following functions are continuous at every point in its domain.

Polynomial Functions $\quad p(x) = a_n x^n + a_{n-1} x^{n-1} + \ldots + a_1 x + a_0$

Rational Functions $\quad r(x) = \dfrac{p(x)}{q(x)}$, $q(x) \neq 0$

Radical Functions $\quad f(x) = \sqrt[n]{x}$

Trigonometric Functions: $\quad \sin x, \cos x, \tan x, \cot x, \sec x, \csc x,$

Exponential / Logarithmic Functions: $\quad g(x) = \log x$; $h(x) = b^x$

Define the Interval where $f(x)$ is continuous

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

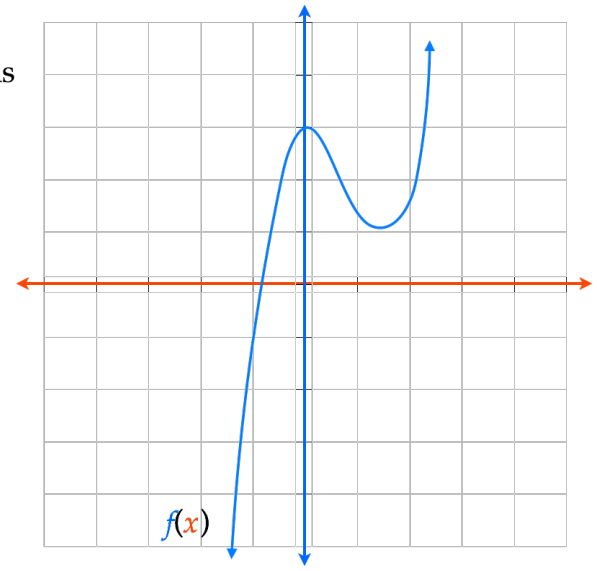
Polynomial Function

Find the Domain

$(-\infty,\infty)$

Continuous across the Domain

$(-\infty,\infty)$



Define the Interval where $f(x)$ is continuous

$f(x) = \dfrac{x^3 - 1}{x - 1}$

Rational Function

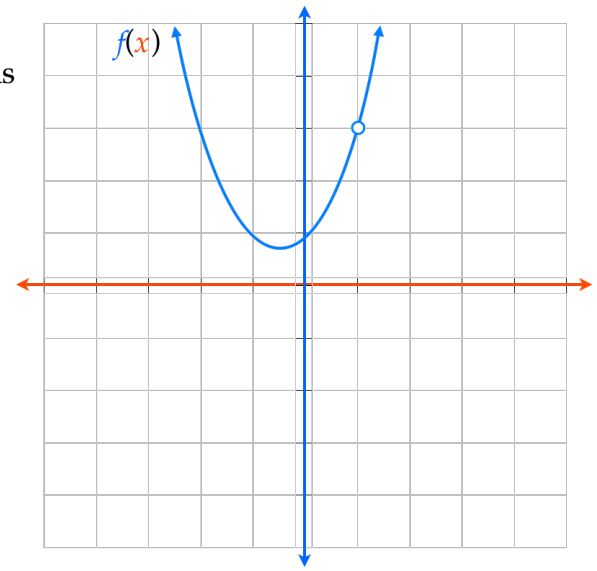
Find the Domain $x - 1 \neq 0$

$x \neq 1$

$(-\infty,1) \cup (1,\infty)$

Continuous across the Domain

$(-\infty,1)$ $(1,\infty)$



Define the Interval where $f(x)$ is continuous

$$f(x) = \sqrt{x + 4}$$

Radical Function

Find the Domain $x + 4 \geq 0$

$[-4,\infty)$ $x \geq -4$

Continuous across the Domain

$[-4,\infty)$