Math 103 Day 4: Continuity

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Tuesday September 21, 2010

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Math 103 Day 4: Continuity

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Continuity

Definition

A function f is continuous at a number a if

$$lim_{x \to a}f(x) = f(a)$$

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Continuity

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A function f is continuous at a number a if

$$lim_{x
ightarrow a}f(x)=f(a)$$

Definition

(More Precisely) f is continuous at a if

- f(a) is defined (in the domain)
- 2 $lim_{x\to a}f(x)$ exists

$$Iim_{x \to a}f(x) = f(a)$$

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More Continuity

Definition

A function f is continuous from the right at a number a if

$$\lim_{x\to a^+} f(x) = f(a)$$

Definition

A function f is continuous from the left at a number a if

 $lim_{x\to a^-}f(x)=f(a)$

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More Continuity

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Definition

A function F is continuous on an interval if it is continuous at every number in the interval. (At the endpoints, if there are any, we define continuity as continuity from the left or the right.)

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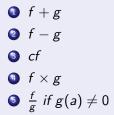
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Theorem

If f and g are continuous at a and c is a constant, then the following functions are continuous at a:



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Theorem

The following types of functions are continuous at every point in their domains:

- polynomials
- Institution rational functions
- I root functions
- trigonometric functions

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Theorem

If f is continuous at b and $\lim_{x\to a}g(x) = b$, then

$$lim_{x\to a}f(g(x)) = f(lim_{x\to a}g(x)).$$

Theorem

If g is continuous at a and f is continuous at g(a), then $f \circ g(x) = f(g(x))$ is continuous at a.

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Theorem

(Intermediate Value Theorem) Suppose f is continuous on the closed interval [a, b] and let N be any number between f(a) and f(b) where $f(a) \neq f(b)$. Then there exists a number c in (a, b) s.t. f(c) = N.

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The Monk Riddle

A monk leaves the monastery at 7am and takes his usual path to the top of the mountain, arriving at 7pm. The following morning, he starts at the top and takes the same path back, arriving at the monastery at 7pm. Show there is a point on the path that the monk will cross at exactly the same time of day on both days.