

# Announcement

Math Club Meeting

February 5 (Tuesday) 7:00pm

Blocker 220

Prof. Jay Walton will speak about mathematical ecology.

Also on the agenda: pizza.

# Continuous functions are the ones that preserve limits

A function  $f$  is *continuous* at a number  $b$  when

1.  $b$  is in the domain of  $f$ , and
2.  $\lim_{x \rightarrow b} f(x)$  exists, and
3.  $\lim_{x \rightarrow b} f(x) = f(b)$ .

## Examples

Many familiar functions are continuous at all points of the domain: polynomials, rational functions, trigonometric functions, exponential, logarithm, square root.

## Non-examples

Piecewise functions, like  $\text{sgn}(x)$ , are discontinuous at jumps.

# Why did the chicken cross the road?

## Theorem (Intermediate-value theorem)

*If a function  $f$  is **continuous** on an interval, and if the graph of  $f$  is sometimes below the  $x$ -axis and sometimes above the  $x$ -axis, then the graph must cross the  $x$  axis at least once.*

## Example

If  $f(x) = x^5 - 3x^2 + 3$ , then the equation  $f(x) = 0$  must have at least one solution.

Why?  $f(0) = 3$  (positive) and  $f(-1) = -1$  (negative), so there must be some  $x$  between  $-1$  and  $0$  where  $f(x) = 0$ .

## Assignment (not to hand in)

- ▶ In Section 2.5, Exercises 3, 17, 21, 23, 29, 37, 39, 43, 47, 53.