Lecture Outline
Wednesday, January 9

Theory: Interval Notation

Often we have to write down intervals, or combinations of intervals, on the real line. For example, we might write something like "the domain is all $x \geq 0$." However, there is a more convenient notation that is usually used. This notation is best explained by example.

Note: Parentheses correspond to $<$ and $>$ and square brackets correspond to $\leq$ and $\geq$.

For multiple intervals, use the $\bigcup$ symbol to combine intervals.

Examples: Interval Notation

1. Write $-1 \leq x < 2$ or $2 < x < 3$ or $x \geq 4$ in interval notation.
2. What is the domain of $y = \ln(x-3)$?
3. What is the domain of $y = \frac{1}{x(x-2)}$?

Theory: Piecewise Functions

A **piecewise function** is a function given by different formulas on different intervals. For example,

$$f(x) = \begin{cases} x^2 & : \ x < 0 \\ x & : \ 0 \leq x < \pi \\ \sin x & : \ x \geq \pi \end{cases}$$

is a piecewise function that is equal to x^2 when x is negative, equal to x when x is in the interval $[0, \pi)$, and equal to $\sin x$ when $x \geq \pi$.

Examples: Piecewise Functions

1. Graph the following piecewise function:

$$f(x) = \begin{cases} \ln x & : \ 0 < x < e \\ 1 & : \ e \leq x < 5 \\ 6 - x & : \ x \geq 5 \end{cases}$$

2. Be able to write down a piecewise function corresponding to a graph.

Theory: Function Composition

An important way of putting two functions together is **function composition**:

$$(f \circ g)(x) = f(g(x)).$$

To evaluate $f \circ g$ at x, first evaluate g at x, and then plug this value into f.