Infinite Processes

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Infinite Processes

We will study several “infinite processes” during the remainder of this semester.

- Improper integrals (integrals over unbounded regions)
- Sequences (infinite lists of numbers)
- Series (infinite summations of constants)
- Power series (infinite sums of polynomials)

You have already studied one other process that we may also include, limits of functions as \( x \to \infty \).
Convergence

For each of these infinite processes the **BIG** question is:

Does the ____________ converge or does it diverge?
Examples

Does the limit \( \lim_{x \to \infty} \frac{\sin x}{x} \) exist?

When we ask this question we mean, does the limit exist as a fixed, finite real number? It does, and its value is 0.

We may express this by writing: \( \lim_{x \to \infty} \frac{\sin x}{x} = 0 \).

Using the language of convergence, we may also say that the function \( \frac{\sin x}{x} \) converges to 0 as \( x \to \infty \) or \( \frac{\sin x}{x} \to 0 \) as \( x \to \infty \).

On the other hand, since the limits \( \lim_{x \to \infty} \sin x \) and \( \lim_{x \to \infty} e^x \) don’t exist, we may say that the functions \( \cos x \) and \( e^x \) both diverge as \( x \to \infty \).
We will have a definition for each “process”.

Learn them!

We will have a definition for the convergence of each “process”.

Learn them!

You will see that these definitions are related, but distinct.