

Solving Finite Limits: $\lim_{x \rightarrow a} f(x)$

1. Plug it in

- If you get a number, you're done!
- If you get $\infty - \infty$, go to Step 2
- If you get $\frac{0}{0}$, go to Step 3
- If you get $\frac{\text{nonzero}}{0}$, go to Step 4

2. Turn the expression into a single fraction

- If the expression is the sum or difference of two fractions, find a common denominator
- Go to Step 3

3. Simplify

- Factor numerator and denominator completely.
- Cancel any like terms
- Return to Step 1

4. The limit either does not exist, or goes to $\pm\infty$. Check the limit from either side.

- **From the left:** Evaluate $\lim_{x \rightarrow a^-} f(x)$. You will get either $\frac{\text{nonzero}}{0^-}$ or $\frac{\text{nonzero}}{0^+}$
- **From the right:** Evaluate $\lim_{x \rightarrow a^+} f(x)$. You will get either $\frac{\text{nonzero}}{0^-}$ or $\frac{\text{nonzero}}{0^+}$
- If the limits from either side are the same, that is the limit:
 1. $\frac{+}{+} = \infty$
 2. $\frac{-}{-} = \infty$
 3. $\frac{+}{-} = -\infty$
 4. $\frac{-}{+} = -\infty$
- If the limits are *different* from either side, the limit **Does Not Exist**