

Source: [KBhMATH401Limits](#)

1 | Epsilon Delta Proofs

The secrets of the limit

1.1 | Formal Definition of a Limit

Definition 1 · **Limit Definition** $\lim_{x \rightarrow a} f(x) = L$
for all $\epsilon > 0$, there exists a δ such that *if* $0 < |x - a| < \delta$, *then* $0 < |f(x) - L| < \epsilon$

1.2 | An Epsilon Delta Proof

Let's prove $\lim_{x \rightarrow 2} x^2 = 4$ together!

The crux of the proof is to come up with a value δ that is a function of ϵ assuming that $0 < \epsilon$ that meets $0 < |x - a| < \delta$.

Oh, here's some symbols

Symbol	Definition
\forall	For all
\exists	There exists
<i>s.t.</i>	Such that

And so, the formal and pretentious definition of a limit:

$\lim_{x \rightarrow a} f(x) = L$ where $\forall \epsilon > 0, \exists \delta > 0, \text{ s.t. } 0 < |x - a| < \delta \rightarrow |f(x) - L| < \epsilon$.

This needs to go before **every Epsilon Delta proof**.

- Step 1: Re-write the Definition Above w.r.t. the function
- Step 2: Do scratch work to identify delta
- Step 3: Plug it in to verify