

Eg: $\lim_{x \rightarrow 0^+} (1 + \sin(4x))^{\cot(x)}$

Annotations: $\cot(x) \rightarrow \infty$, $1 + \sin(4x) \rightarrow 1$. A dashed box around 1^∞ is labeled "of type".

(pay attention to direction)

set $y = (1 + \sin(4x))^{\cot(x)}$

then $\ln(y) = \ln((1 + \sin(4x))^{\cot(x)})$

$$= \cot(x) \cdot \ln(1 + \sin(4x))$$

Annotation: $\cot(x) = \frac{1}{\tan(x)}$

so $\lim_{x \rightarrow 0^+} \ln(y) = \lim_{x \rightarrow 0^+} \frac{\ln(1 + \sin(4x))}{\tan(x)}$

Annotations: $\ln(1 + \sin(4x)) \rightarrow 0$, $\tan(x) \rightarrow 0$. A dashed box around the fraction is labeled "DON'T FORGET".

H $\lim_{x \rightarrow 0^+} \left[\frac{\left(\frac{1}{1 + \sin(4x)}\right) \cdot \cos(4x) \cdot 4}{\sec^2(x)} \right]$

Annotations: $\frac{1}{1 + \sin(4x)} \rightarrow 1$, $\cos(4x) \rightarrow 1$, $\sec^2(x) \rightarrow 1$.

so $\lim_{x \rightarrow 0^+} \ln(y) = 4$

Annotation: \leftarrow not the final answer!

conclude

$$\lim_{x \rightarrow 0^+} (1 + \sin(4x))^{\cot(x)} = \lim_{x \rightarrow 0^+} y$$

$$= \lim_{x \rightarrow 0^+} e^{\ln(y)} = e^4$$