

Limites remarquables

📌 Ce qu'on doit retenir : (≠ limites)

📌 En $+\infty$:

$$\lim_{u \rightarrow +\infty} e^u = +\infty$$

$$\lim_{u \rightarrow +\infty} \frac{e^u}{u} = +\infty$$

Cas général :

$$\lim_{u \rightarrow +\infty} \frac{e^{mu}}{u^n} = +\infty ; (m, n) \in \mathbb{N}^{*2}$$

📌 En $-\infty$:

$$\lim_{u \rightarrow -\infty} e^u = 0$$

$$\lim_{u \rightarrow -\infty} u e^u = 0$$

Cas général :

$$\lim_{u \rightarrow -\infty} u^n e^{mu} = 0 ; (m, n) \in \mathbb{N}^{*2}$$

📌 En 0 :

$$\lim_{u \rightarrow 0} \frac{e^u - 1}{u} = 1$$



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Examples:

$$\begin{aligned}
 1) \lim_{n \rightarrow +\infty} x^2 - e^n \\
 &= \lim_{n \rightarrow +\infty} \underbrace{x^2}_{+\infty} \left(1 - \underbrace{\frac{e^n}{n^2}}_{+\infty}\right) \\
 &= \boxed{-\infty}
 \end{aligned}$$

$$\begin{aligned}
 2) \lim_{n \rightarrow +\infty} e^{3n} - 2e^n \\
 &= \lim_{n \rightarrow +\infty} \underbrace{e^n}_{+\infty} \left(\underbrace{e^{2n}}_{+\infty} - 2\right) = \boxed{+\infty}
 \end{aligned}$$

$$\begin{aligned}
 \underbrace{m}_{\rightarrow +\infty} \\
 \frac{e}{\underbrace{n}_{\rightarrow +\infty}}
 \end{aligned}$$

$$\begin{aligned}
 \underbrace{e}_{\rightarrow +\infty} \\
 \underbrace{e}_{\rightarrow +\infty}
 \end{aligned}$$

$$\begin{aligned}
 3) \lim_{n \rightarrow -\infty} (x^2 - n) e^x \\
 &= \lim_{n \rightarrow -\infty} \underbrace{x^2 e^n}_{\downarrow 0} - \underbrace{n e^n}_{\downarrow 0} \\
 &= \boxed{0}
 \end{aligned}$$

$$\begin{aligned}
 4) \lim_{n \rightarrow 0} \frac{x}{1 - e^{-x}} \\
 &= \lim_{n \rightarrow 0} \frac{-n}{e^{-n} - 1} \\
 &= \lim_{n \rightarrow 0} \frac{1}{\frac{e^{-n} - 1}{-n}} = \boxed{1}
 \end{aligned}$$

$$\begin{aligned}
 \underbrace{n}_{\rightarrow -\infty} \\
 \underbrace{e}_{\rightarrow 0}
 \end{aligned}$$

$$\begin{aligned}
 \underbrace{e}_{\rightarrow 0} \\
 \frac{e - 1}{\underbrace{1}_{\rightarrow 1}}
 \end{aligned}$$

car:

$$\begin{cases} \lim_{n \rightarrow 0} -n = 0 \\ \lim_{n \rightarrow 0} \frac{e^x - 1}{n} = 1 \end{cases}$$