Eg: $\displaystyle \lim_{\boxed{x \to 0^+}} \Big(\underbrace{1 + \sin(4x)}_{\to 1}\Big)^{\overbrace{\cot(x)}^{\to \infty}}$ $\quad$ $\boxed{\text{of type } 1^\infty}$

(pay attention to direction)

$$\text{\underline{set}} \quad y = \left(1 + \sin(4x)\right)^{\cot(x)}$$

$$\text{\underline{then}} \quad \ln(y) = \ln\left(\left(1+\sin(4x)\right)^{\cot(x)}\right)$$

$$= \underbrace{\cot(x)}_{\left(\frac{1}{\tan(x)}\right.} \cdot \ln\left(1 + \sin(4x)\right)$$

$$\text{\underline{so}} \quad \lim_{x\to 0^+} \ln(y) = \boxed{\lim_{x\to 0^+}} \frac{\ln(1+\sin(4x)) \to 0}{\tan(x) \to 0}$$

[DON'T FORGET]

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

1 1 1

$$\text{\underline{so}} \quad \lim_{x\to 0^+} \ln(y) = 4$$

Not the final answer!

conclude

$$\lim_{x\to 0^+} \left([redacted]\, 1+ \sin(4x)\right)^{\cot(x)} = \lim_{x \to 0^+} y$$

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