$$\sin(x) = x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} \cdots$$

$$\Rightarrow \sin(x) = \sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)!} x^{2n}$$

$$\lim_{n \to \infty} \sin\left(\frac{1}{n}\right) \approx \frac{1}{n}$$

$$-1 < \lim_{n \to 0} \sin\left(\frac{1}{n}\right) < 1$$

As n approaches infinity, $\sin\left(\frac{1}{n}\right)$ is approximately $\frac{1}{n}$ however, as n approaches zero, $\sin\left(\frac{1}{n}\right)$ continuously moves between -1 and 1 while $\frac{1}{n}$ approaches infinity

as $n \to \infty$, error $\sin\left(\frac{1}{n}\right) = O(0)$

as $n \to 0$, error $\sin\left(\frac{1}{n}\right) = O(\infty)$

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$$\cos(x) = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} \cdots$$

$$\Rightarrow \cos(x) \simeq \frac{(-1)^n}{(2n)!} x^{2n}$$

$$\lim_{n \to \infty} \cos\left(\frac{1}{n}\right) \approx 1 - \frac{1}{(2 \cdot n^2)}$$

$$\lim_{n \to 0} \cos\left(\frac{1}{n}\right) \not\approx 1 - \frac{1}{(2 \cdot n^2)}$$

As n approaches infinity, $\cos\left(\frac{1}{n}\right)$ is approximately $1 - \frac{1}{(2 \cdot n^2)}$ however, as n approaches zero $\cos\left(\frac{1}{n}\right)$ moves between -1 and 1 while $1 - \frac{1}{(2 \cdot x^2)}$ approaches negative infinity.

as $n \to \infty$ error $\cos\left(\frac{1}{n}\right) = O(0)$

as $n \to 0$ error $\cos\left(\frac{1}{n}\right) = O(\infty)$

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