Info

This note, that was found here, as a part of a collection
is written (completely with human hands) by Rupadarshi Ray,
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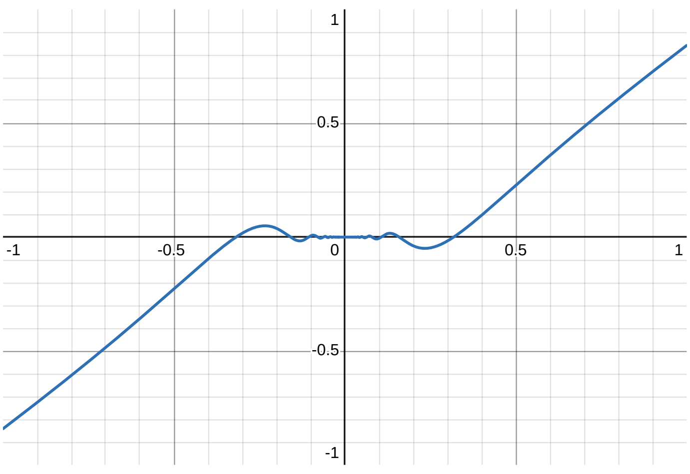
# $x^2 \sin \frac{1}{x}$




$$\frac{x^2 \sin \frac{1}{x}}{x} = x \sin\left(\frac{1}{x}\right)$$

and

$$-x \leq x \sin\left(\frac{1}{x}\right) \leq x$$

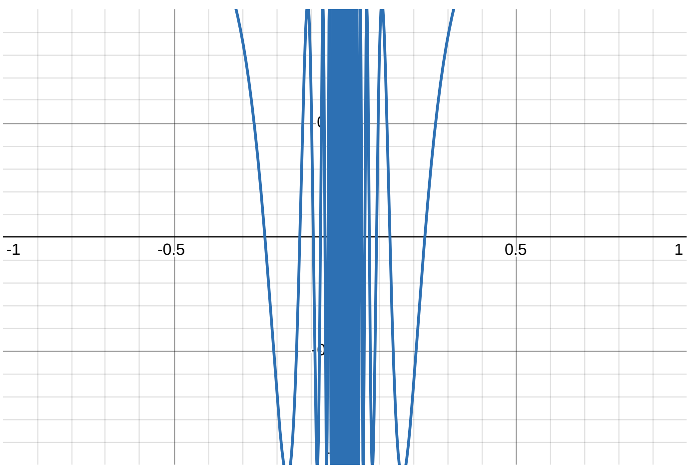
Thus

$$\lim_{x \to 0} \frac{x^2 \sin \frac{1}{x}}{x} = x \sin\left(\frac{1}{x}\right) = 0$$

Now

$$\frac{\mathrm{d}}{\mathrm{d}x} x^2 \sin\left(\frac{1}{x}\right) = 2x \sin\left(\frac{1}{x}\right) - \cos\left(\frac{1}{x}\right) \text{ on } \mathbb{R} \setminus \{0\}$$

which looks like

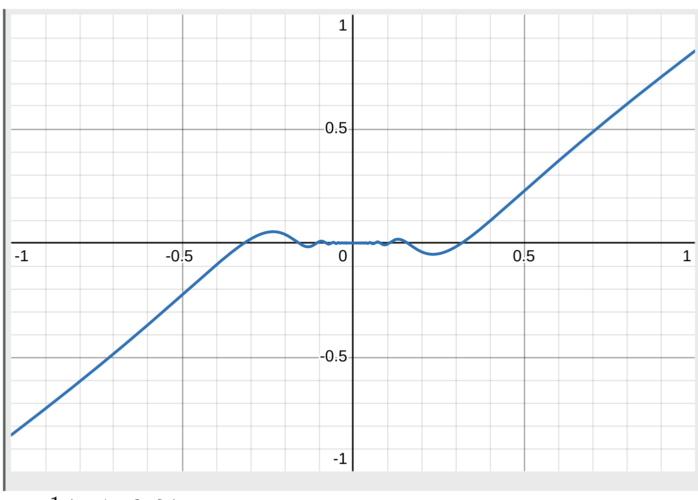



because

$$\lim_{x \to 0} \cos\left(\frac{1}{x}\right)$$

does not exist.

Therefore,

> **Proposition:**
>
> $$x^2 \sin \frac{1}{x}$$
>
> 
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>
> is $\mathcal{C}^1(\mathbb{R} \setminus \{0\})$ and differentiable at 0 but derivative is not continuous at 0.

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Current note has 0 direct children and 0 total descendants.

- squishy
  - pow
    - $x^2 \sin \frac{1}{x}$

And it has 28 siblings.

- squishy
  - pow
    - Angle function
    - Bessel functions
    - $\cos \sqrt{z}$
    - The complex logarithm
    - $\sum_{n \geq 0} z^{n!}$

- $z^3 - 3z$
- $$\frac{r_0}{1 + \epsilon \cos b\theta}$$
- $\cos\left(\pi \frac{p}{q}\right)$
- $\frac{\cos x^k}{x}$
- Elliptic integrals and Jacobi elliptic functions
- The complex exponential $\exp(z)$
- $\exp\left(\frac{z+1}{z-1}\right)$
- $e^{-x^2}$
- [Only sum terms that are multiples of $N$ in $\mathbb{C}[[z](https://rupadarshiray.github.io/notes/YchnxQ9SF1RsuKjBntMv8a.$
]]
- $\int \frac{1}{x^2+bx+c}$
- $\frac{\exp(z)}{1-z}$
- $\sin x$
- $\sin(x \sin(x))$
- $\frac{\sin x}{x}$
- stock.sin x by xk
- $\sin x^2$
- $\sqrt{z}$
- $\sqrt{z^2 - 1}$
- Theta functions
- Weierstrass elliptic function $\wp$
- Weierstrass' primary factors
- $x^2 \sin \frac{1}{x}$
- $x + x^2 \sin \frac{1}{x}$