$$f(x) = \begin{cases} x^{n+2}\sin\left(\frac{1}{x}\right) & ; x \neq 0 \\ 0 & ; x = 0 \end{cases}$$

$$f'(x) = (n+2)\, x^{n+1} \sin\left(\frac{1}{x}\right) + x^{n+2} \cos\left(\frac{1}{x}\right)\left(\frac{-1}{x^2}\right)$$

$$f'(x) = (n+2)\, x^{n+1} \sin\left(\frac{1}{x}\right) - x^{n} \cos\left(\frac{1}{x}\right)$$

$\cancel{f''(x)}$ this function will again differentiable if LHD = RHD at $x = 0$

① LHD

$$= \lim_{h \to 0} \frac{f(0-h) - f(0)}{-h} = \lim_{h \to 0} \frac{(n+2)(-h)^{n+1} \sin\left(\frac{1}{0-h}\right) - (0-h)^{n} \cos\left(\frac{1}{0-h}\right) - 0}{-h}$$

$$= \lim_{h \to 0} (n+2)\cancel{(-1)^{n}}\, h^{n} \sin\left(\frac{1}{h}\right) - (-1)^{n-1} h^{n-1} \cos\left(\frac{1}{h}\right)$$

$\because \lim_{h \to 0} \sin\left(\frac{1}{h}\right) = \lim_{h \to 0} \cos\left(\frac{1}{h}\right)$

Both oscillates between -1 to 1 · ~~definite~~ value between -1 to 1

so $\lim_{h \to 0} h^{(n-1)} \cos\left(\frac{1}{h}\right) = 0$ if $n - 1 > 0$

$\Rightarrow$ $\underline{\underline{n > 1}}$

so Answer is $\underline{\underline{n > 1}}$