

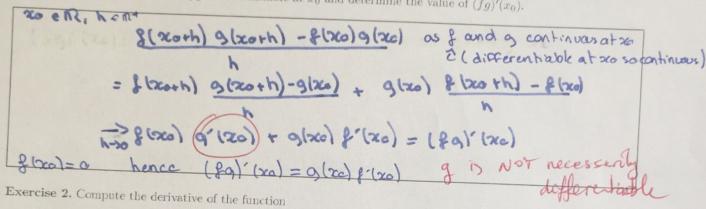
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Exercise 1. Let f and g be two functions defined in a neighborhood V of  $x_0 \in \mathbb{R}$  such that:

- $f(x_0) = 0$ ,
- f is differentiable at  $x_0$ ,
- g is continuous at x<sub>0</sub>.

Show that the product function fg is differentiable at  $x_0$  and determine the value of  $(fg)'(x_0)$ .



$$f: \mathbb{R} \longrightarrow \mathbb{R}$$
$$x \longmapsto \frac{\sin(x)\cos(x)}{2 + \cosh(x)\sqrt{|x|}} + 1$$

at 0. No justifications required.

$$f'(0) = \frac{1}{2}$$

Exercise 3. Compute the derivative of the function

$$f: \mathbb{R} \longrightarrow \mathbb{R}$$
$$x \longmapsto \sin(e^{x\cos(x)}).$$

No justifications required.

$$\forall x \in \mathbb{R}, f'(x) = (\cos(x) - x \sin(x))e^{x\cos(x)} \cos(e^{x\cos(x)})$$

Exercise 4. Determine limits (in  $\mathbb{R}$ ) of sequences  $(u_n)_n$  defined below; if a limit does not exist, cross out the equal sign and write "DNE."