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**Exercise 1**

Use the squeeze Theorem to evaluate

$$\lim_{x \rightarrow 0} x^4 \cos\left(\frac{x^7 + 1}{\ln(|2x^5 + \exp x|)}\right).$$

**Exercise 2**

Use the  $\epsilon - \delta$  definition to show that the function  $f(x) = 2x^2 - \frac{1}{2}$  is continuous at  $\frac{1}{\sqrt{2}}$ .

**Exercise 3**

Let  $a, b$  two real numbers and  $f$  a function given by

$$f(x) = \begin{cases} ax + b & \text{if } x \leq 0 \\ \frac{1}{x+2} & \text{if } x > 0. \end{cases}$$

1. Find a condition on  $b$  so that  $f$  be a continuous on  $\mathbb{R}$ .
2. Determine  $a$  and  $b$  so that  $f$  be differentiable on  $\mathbb{R}$ , and give the value of  $f'(0)$ .