

[11. 0102]

$$f(x) = 3x - 4x^3$$

f est définie et continue sur \mathbb{R} .

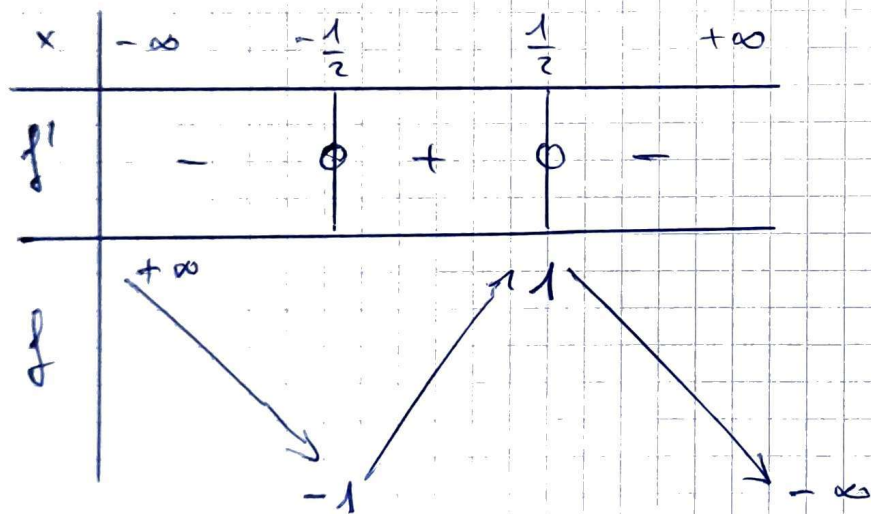
$$f'(x) = 3 - 12x^2$$

$$f'(x) = 0 \Leftrightarrow 3 - 12x^2 = 0$$

$$\Leftrightarrow 3 = 12x^2$$

$$\Leftrightarrow x^2 = \frac{3}{12}$$

$$\Leftrightarrow \begin{cases} x = +\sqrt{\frac{3}{12}} = +\sqrt{\frac{1}{4}} = \frac{1}{2} \\ x = -\sqrt{\frac{3}{12}} = -\sqrt{\frac{1}{4}} = -\frac{1}{2} \end{cases}$$



$$f'(0) = 3 > 0$$

$$f'(1) = 3 - 12 = -9 < 0$$

$$f'(-1) = 3 - 12 = -9 < 0$$

$$\begin{aligned} f\left(-\frac{1}{2}\right) &= -\frac{3}{2} + \frac{4}{8} \\ &= -\frac{3}{2} + \frac{1}{2} \\ &= -1 \end{aligned}$$

$$\begin{aligned} f\left(\frac{1}{2}\right) &= \frac{3}{2} - \frac{4}{8} \\ &= \frac{3}{2} - \frac{1}{2} \\ &= 1 \end{aligned}$$

$$f(x) = 3x - 4x^3 = x^3 \left(\frac{3}{x^2} - 4 \right)$$

$$\lim_{x \rightarrow +\infty} \frac{3}{x^2} = \lim_{x \rightarrow -\infty} \frac{3}{x^2} = 0$$

$$\lim_{x \rightarrow +\infty} \left(\frac{3}{x^2} - 4 \right) = \lim_{x \rightarrow -\infty} \left(\frac{3}{x^2} - 4 \right) = -4$$

donc $\lim_{x \rightarrow +\infty} f(x) = -\infty$ et $\lim_{x \rightarrow -\infty} f(x) = +\infty$