

## Temat VIII

### The limits of functions

Find the limit (finite or infinite) or prove that the limit does not exist:

1.  $\lim_{x \rightarrow 2} \frac{3x^2 - 5x - 2}{5x^2 - 20}$ .
2.  $\lim_{x \rightarrow -5} \frac{2x^3 + 250}{x^2 + 4x - 5}$ .
3.  $\lim_{x \rightarrow 1} \frac{x^n - 1}{x - 1}$ .
4.  $\lim_{x \rightarrow +\infty} (\sqrt{e^x + 1} - \sqrt{e^x - 1})$ .
5.  $\lim_{x \rightarrow 0} \frac{\sqrt{x^2 + 1} - 1}{\sqrt{x^2 + 25} - 5}$ .
6.  $\lim_{x \rightarrow 0} \frac{1}{x^2}$ .
7.  $\lim_{x \rightarrow 0} \frac{1}{x^3}$ .
8.  $\lim_{x \rightarrow 0} e^{\frac{1}{x}}$ .
9.  $\lim_{x \rightarrow 0} e^{-\frac{1}{x^2}}$ .
10.  $\lim_{x \rightarrow 0} \frac{\sin ax}{bx}$ ,  $b \neq 0$ .
11.  $\lim_{x \rightarrow 0} \frac{cx}{\operatorname{tg} dx}$ ,  $d \neq 0$ .
12.  $\lim_{x \rightarrow 0} \frac{\sin ax}{\operatorname{tg} bx}$ ,  $b \neq 0$ .
13.  $\lim_{x \rightarrow -\infty} \frac{\sin x}{x}$ .
14.  $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\cos x}{x - \frac{\pi}{2}}$ .
15.  $\lim_{x \rightarrow \pi} \frac{1 + \cos x}{\sin^2 x}$ .
16.  $\lim_{x \rightarrow +\infty} \left( \frac{2x^2 + 1}{3x^2 + 1} \right)^{x-x^2}$ .
17.  $\lim_{x \rightarrow 0} \left( \frac{2x^2 + 1}{3x^2 + 1} \right)^{-x^2+x^3}$ .
18.  $\lim_{x \rightarrow \frac{\pi}{2}} \left( \operatorname{tg} x - \frac{1}{\frac{\pi}{2} - x} \right)$ .