

**Excercises**  
**Matematics A1a**  
**Limits of functions**

1. Find the limits of the following functions:

$$\lim_{x \rightarrow 5^-} \frac{|3x-15|}{5-x}, \quad \lim_{x \rightarrow \pi^-} \ln \sin x, \quad \lim_{x \rightarrow 1^+} \frac{x}{x^2 + 2x - 3},$$

$$\lim_{x \rightarrow 1} \frac{x^3 + 3x^2 + 2x}{x^2 + x - 6}, \quad \lim_{x \rightarrow 2} \frac{x^3 + 3x^2 + 2x}{x^2 + x - 6}, \quad \lim_{x \rightarrow 0} \frac{\operatorname{tg} 5x}{\sin 3x}, \quad \lim_{x \rightarrow 0} \frac{1 - \cos 2x}{3x^2}, \quad \lim_{x \rightarrow 0} \frac{\cos 3x - \cos 5x}{x^2}$$

$$\lim_{x \rightarrow -2} \frac{\sqrt{3+x+x^2} - \sqrt{9-2x+x^2}}{x^2 - 3x + 2}, \quad \lim_{x \rightarrow \frac{\pi}{2}} \left( \frac{\pi}{2} - x \right) \operatorname{tg} x, \quad \lim_{x \rightarrow 0} \frac{\ln(x+5)}{x}, \quad \lim_{x \rightarrow \frac{\pi}{2}} \frac{\cos \frac{x}{2} - \sin \frac{x}{2}}{\cos x},$$

$$\lim_{x \rightarrow \infty} \left( \sqrt{x^2 + 1} - \sqrt{x^2 - 1} \right), \quad \lim_{x \rightarrow \infty} \frac{3x - 22x^2}{4x^2 - 3}, \quad \lim_{x \rightarrow \infty} \left( \frac{x+1}{2x-1} \right)^x, \quad \lim_{x \rightarrow \infty} \left( \frac{x+1}{x-1} \right)^x.$$

2. What value should be assigned to  $b$  to make the function  $f(x) = \begin{cases} -x^2 + 6x - 8, & \text{ha } x \leq 2, \\ 4x + b, & \text{ha } x > 2. \end{cases}$  continuous at  $x=2$ ?