

Determine where the following functions are discontinuous, and the type of discontinuity :

$$f(x) = \begin{cases} x^2 + 1 & x > 4 \\ x & x \leq 4 \end{cases} \quad g(x) = \begin{cases} 3x + 1 & x > 3 \\ 4 & x = 3 \\ 4x - 2 & x < 3 \end{cases}$$

Find value(s) for a , or a and b , that make the following functions continuous everywhere.

$$f(x) = \begin{cases} x^2 + a & x > -1 \\ 3x & x \leq -1 \end{cases} \quad g(x) = \begin{cases} 3x^2 - ax + 1 & x > 2 \\ 5 & x = 2 \\ 3x - b & x < 2 \end{cases}$$

Evaluate the following limits:

$$\begin{aligned} \lim_{x \rightarrow 0} \frac{\sin 2x}{x} & \quad \lim_{\theta \rightarrow 0} \frac{1 - \cos 2\theta}{3\theta^2} & \quad \lim_{t \rightarrow 0} \frac{t^2}{(\sin 2t)(\sin 3t)} & \quad \lim_{x \rightarrow 0} \frac{\tan 5x}{3x} \\ \lim_{x \rightarrow 0} \frac{x \sin(-2x)}{(\sin 4x)(\sin 3x)} & \quad \lim_{x \rightarrow \infty} \frac{e^{3x}}{2 + e^{2x}} & \quad \lim_{x \rightarrow \infty} \frac{2x - \cos 3x}{x^2} \end{aligned}$$