

Find the limits if they exist.

$$(1) \lim_{x \rightarrow 1} \frac{1}{x-1}$$

$$(2) \lim_{x \rightarrow 1} \frac{x^2 + 1}{x-1}$$

$$(3) \lim_{x \rightarrow 1} \frac{x^2 - 1}{x-1}$$

$$(4) \lim_{x \rightarrow 1} \frac{x^2 - 1}{x^2 + 4x - 5}$$

$$(5) \lim_{x \rightarrow 1} \frac{\sin x}{x}$$

$$(6) \lim_{x \rightarrow 0} \frac{\sin x}{x}$$

$$(7) \lim_{x \rightarrow 0} \sin \frac{1}{x}$$

$$(8) \lim_{x \rightarrow 0} x \sin \frac{1}{x}$$