

$$122. \quad f(x) = \begin{cases} 0, & \text{if } x \text{ is rational} \\ 1, & \text{if } x \text{ is irrational} \end{cases}$$

$$g(x) = \begin{cases} 0, & \text{if } x \text{ is rational} \\ x, & \text{if } x \text{ is irrational} \end{cases}$$

$\lim_{x \rightarrow 0} f(x)$  does not exist.

No matter how “close to” 0  $x$  is, there are still an infinite number of rational and irrational numbers so that

$\lim_{x \rightarrow 0} f(x)$  does not exist.

$$\lim_{x \rightarrow 0} g(x) = 0$$

when  $x$  is “close to” 0, both parts of the function are “close to” 0.