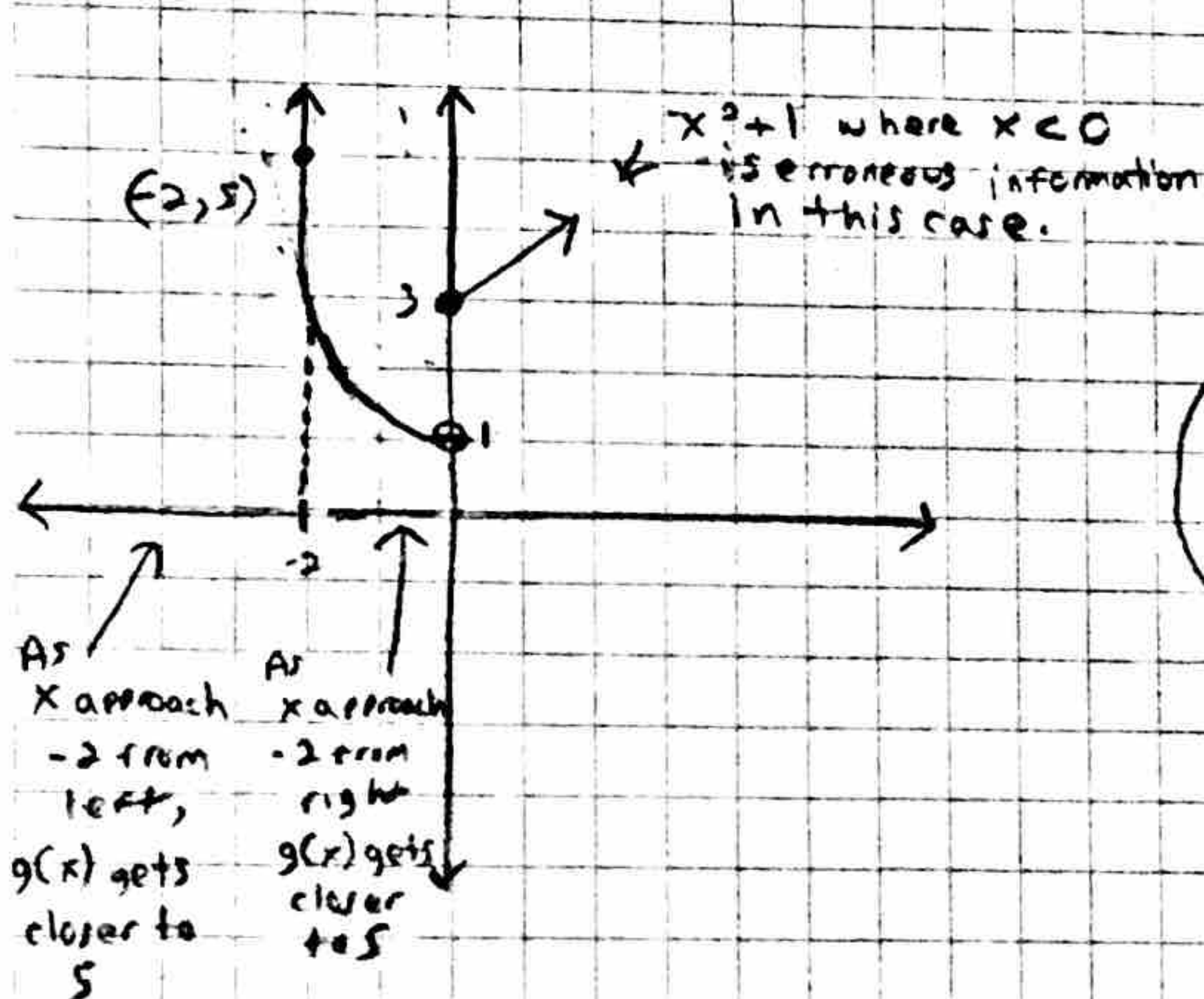


# Finding a Limit of a Piecewise Function by Graphing

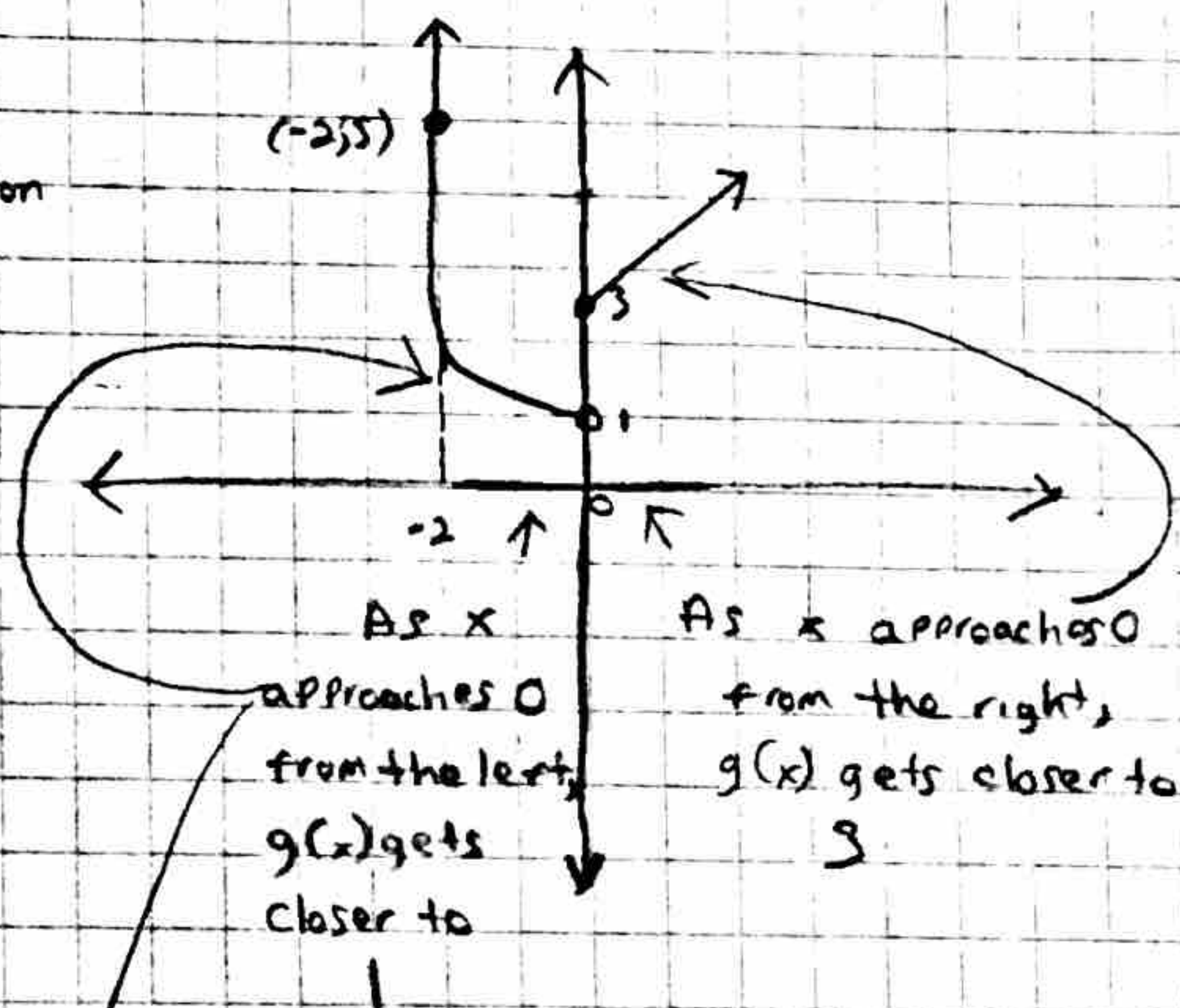
$$\text{Let } g(x) = \begin{cases} x^2 + 1; & x < 0 \\ 2x + 3; & x \geq 0 \end{cases}$$

What is the limit of  $g(x)$  as  $x$  approaches  $-2$ ?  
 What is the limit of  $g(x)$  as  $x$  approaches  $0$ ?



$$(-2)^2 + 1 = 5$$

$$\lim_{x \rightarrow -2} g(x) = 5$$



$$\lim_{x \rightarrow 0} g(x) = \text{Does not exist.}$$

This plays out the Theorem:

$$\lim_{x \rightarrow a} f(x) = L \text{ if and only if } \lim_{x \rightarrow a^+} f(x) = L \text{ and } \lim_{x \rightarrow a^-} f(x) = L.$$

If the limit from the left and right are not equal, then we say  $\lim_{x \rightarrow a} f(x)$  does not exist.