Other (Ugly) Discontinuities

The limit \( \lim_{x \to 0} \sin(1/x) \) is undefined as \( x \) goes to 0. The graph of \( y = \sin(1/x) \) is similar to the one in Figure 1; the function \( \sin(1/x) \) has no left or right limit as \( x \) goes to 0. Here, we say the limit does not exist.

![Figure 1](image)

Figure 1: An example of an ugly discontinuity: a function that oscillates a lot as it approaches the origin

There are many discontinuities of this type — for example, things that oscillate as time goes to infinity — but we’re not going to worry about them in this course.