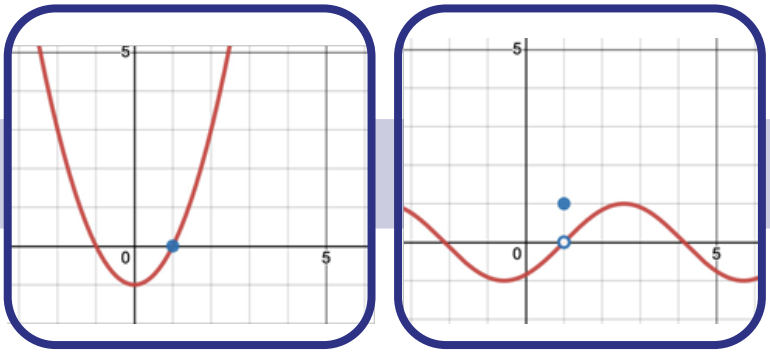
LIMITS

CONCEPT The limit of a function can be a little bit of a confusing concept for some students. Essentially, it is asking what is the value of a function (its output) approaching as its input approaches some target value. Note that this is subtly different than asking what is the value of the function at the exact input value. In many cases, the value of the function is the exact same as its limit at a given x-value, but it becomes an interesting problem when they are different. It can be helpful to think: where does the function look like it wants to be?



EXAMPLES

Look at the two graphs above. The one on the left passes through the point (1, 0), so f(1)=0. Additionally, if we let x get really close to 1, the outputs will get really close to 0 (so close that we can't tell the difference). Therefore, the limit of f(x) as x approaches 1 is 0. On the right, the graph looks like it wants to pass through (1,0), but makes a quick jump up to 1. So, f(1) = 1. However, as x approaches 1, the value of the function still approaches 0, so the limit is still 0.

BACKGROUND

The concept of a limit can be rigorously defined, but that is not important here. Two mathematicians actually discovered these properties individually hundreds of years ago. Isaac Newton and Gottfried Leibniz came up with these and other calculus topics. Because of the controversy surrounding them, they had to invent rigorous proofs to show that doing math with limits was, in fact, justifiable.