

Approach Statements

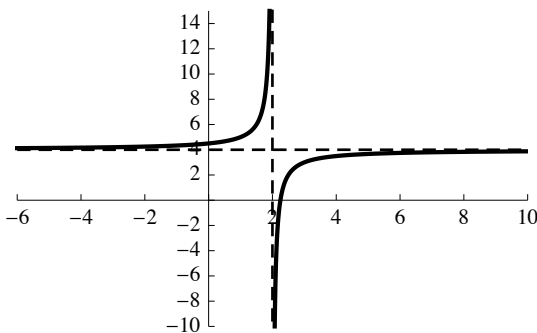
Statements of the form,

$$\text{As } x \rightarrow +\infty, y \rightarrow 8$$

$$\text{As } x \rightarrow -\infty, y \rightarrow -8$$

are called *approach statements*, because they describe what is happening to the function when the x values approach some number. As we saw in the last set of notes, we use approach statements to describe the end behavior of a function.

We can also use approach statements to describe what happens to a function when the x values approach a vertical asymptote. Let's consider the following function:



In words, it's really easy to describe what is happening to the function as the x values approach the asymptote's x -intercept ($x = 2$):

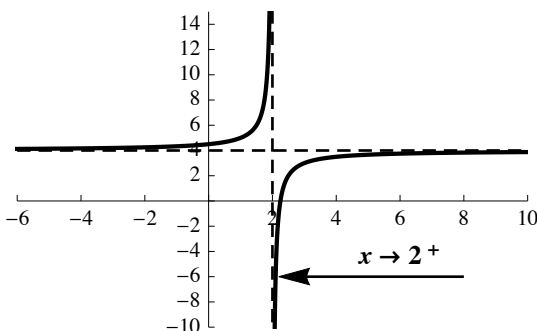
- As x decreases (8, 6, 4, ...) and approaches 2, y approaches $-\infty$, and
- As x increases ($-8, -6, -4, \dots$) and approaches 2, y approaches $+\infty$.

Another way of saying this could be:

- As x approaches 2 from the right (8, 6, 4, ...), y approaches $-\infty$, and
- As x approaches 2 from the left ($-8, -6, -4, \dots$), y approaches $+\infty$.

As always, mathematicians, prefer short-hand notation when writing statements. To indicate that the x values are approaching the asymptote from the right (which is the positive x axis), they use

$$\text{As } x \rightarrow 2^+, y \rightarrow -\infty$$



To indicate that the x values are approaching the asymptote from the left (which is the negative x axis), they use

$$\text{As } x \rightarrow 2^-, y \rightarrow +\infty$$

