Situation 41: Square Roots
Prepared at Penn State
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Prompt

A teacher asks her students to sketch the graph of $f(x) = \sqrt{-x}$. A student responds, "That's impossible! You can't take the square root of a negative number!"

Commentary

Mathematical Foci

Mathematical Focus 1

The domain of the square root function is all nonnegative real numbers. To find the domain of $f(x) = \sqrt{-x}$, one may algebraically solve the inequality $-x \geq 0$.

Mathematical Focus 2

Use a transformation of the graph of the known function, $g(x) = \sqrt{x}$, in order to generate a graph of a less familiar function, $f(x) = \sqrt{-x}$. If the graph of $g(x) = \sqrt{x}$ is reflected about the vertical axis, the result is the graph of $f(x) = \sqrt{-x}$ as is shown in the following figure. It is important to recognize that the point (0, 0) is on both graphs.

no data   Function Plot ▼

$y = \sqrt{x}$

$y = \sqrt{-x}$
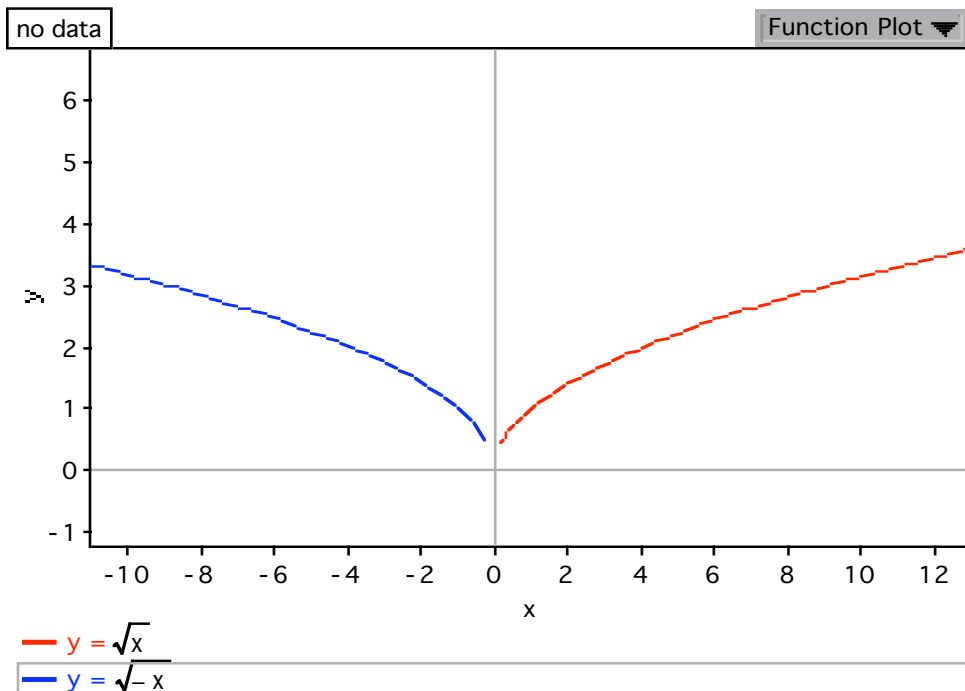
Mathematical Focus 3

Verify that the function $f(x) = \sqrt{-x}$ makes sense by testing a few specific negative values and a few specific positive values for *x*. It might help to choose numbers whose absolute values are perfect squares, such as these shown on the following chart:

X	$\sqrt{-x}$
-4	$\sqrt{-(-4)} = 2$
4	$\sqrt{-4}$ is not a real number
-1	$\sqrt{-(-1)} = 1$
1	$\sqrt{-1}$ is not a real number
0	$\sqrt{-0} = 0$

The results for *x*-values –4, 4, -1, 1, and 0 suggest the function's domain contains all non-positive numbers.