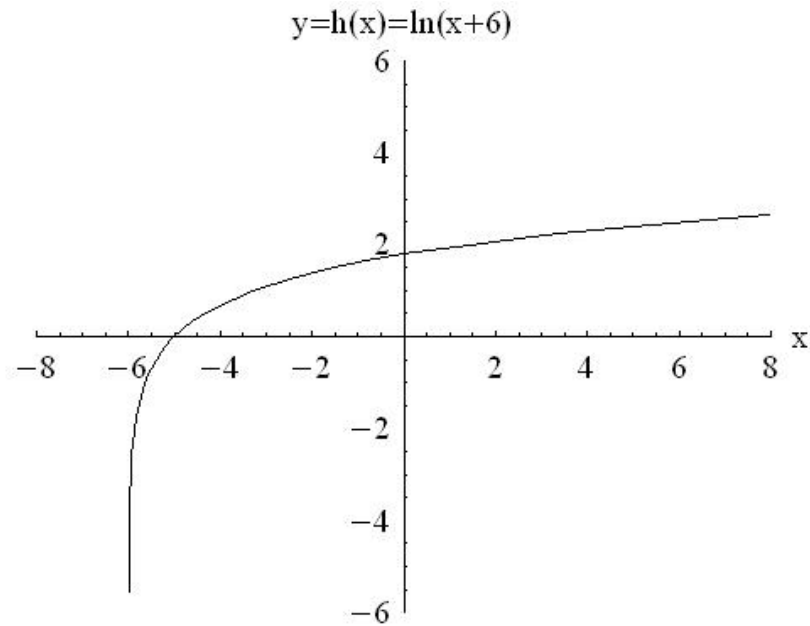
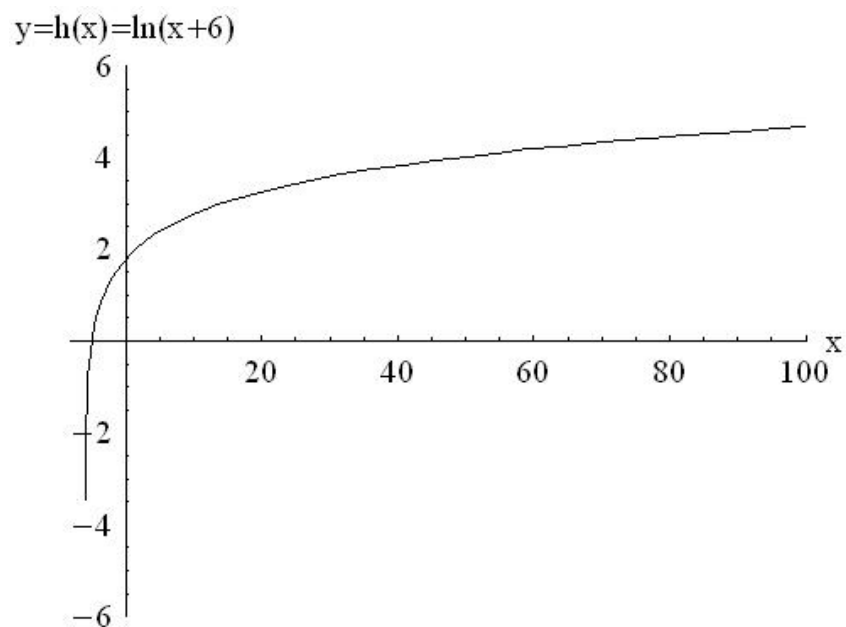


Example 1.3.31 Use a calculator to sketch the function $h(x) = \ln(x + 6)$. Determine the domain and range by looking at the graph.

The sketches were generated using *Mathematica*, but you could use a calculator if you like.

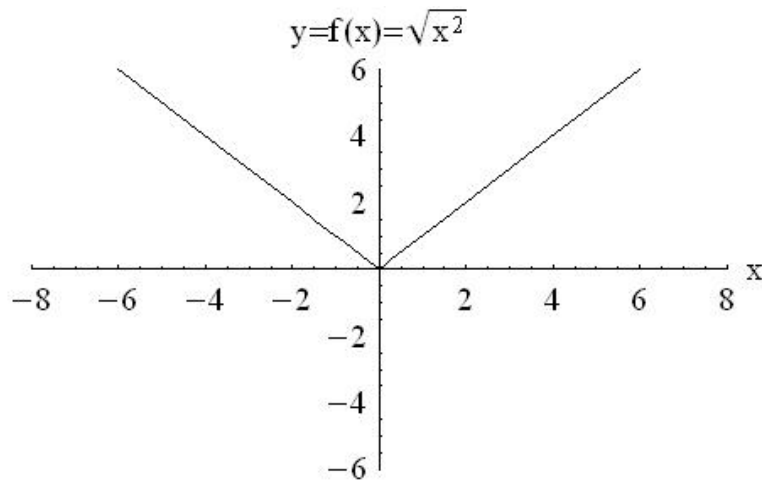


From the sketch, we can guess that the domain is $x \in (-6, \infty)$, and the range is $y \in (-\infty, \infty)$. The graph does not look like it is “levelling out” as x increases. Another sketch shows this:



It is still increasing at $x = 100$, although very slowly.

Example 1.3.53 The function $f(x) = \sqrt{x^2}$ is one of our twelve basic functions written in a different form. Graph the function and identify which basic function it is. Explain algebraically why the two functions are equal.



The function $f(x) = \sqrt{x^2}$ looks a lot like $g(x) = |x|$, the absolute value function.

Algebraically,

$$f(x) = \sqrt{x^2} = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$

$$g(x) = |x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$

We see that these are the same functions. Alternately, we could write $f(x) = \sqrt{x^2} = \sqrt{|x|^2} = |x| = g(x)$.