Section 4.5 Graphs of Logarithmic Functions

Graphical Features of the Logarithm

$g(x) = \log_b(x)$

- Has a horizontal intercept at $(1,0)$
- Has a vertical asymptote at $x = 0$
- Graph is increasing and concave down
- Domain of the function is $(0, \infty)$
- Range is all real numbers $(-\infty, \infty)$

When sketching a general logarithm with base b, it can be helpful to remember that the graph will pass through the points $(1,0)$ and $(b,1)$

Example 1

Find the domain of the function $f(x) = \log(5-2x)$

$5 - 2x > 0$ ← the logarithm is only defined when the input is positive.

$\frac{-2x}{-2} > \frac{-5}{-2}$

$x < \frac{5}{2}$

$(-\infty, 5/2)$

Example 2

Find the domain of $f(x) = \log(x-5) + 2$

$x > 5$ $\quad (5, \infty)$

Transformations of the Logarithmic Function

$\log_b X = \frac{\log_c X}{\log_c b} = \frac{1}{\log_c b} \cdot \log_c X$ ← will result in a stretch or compression

← if # under 1 is less than 1, it will be a stretch

$f(x) = \log(cx) \rightarrow f(x) = \log(c) + \log(x)$

← will result in a horizontal stretch or compression