1. Suppose that \( p(x) \) is a polynomial of degree 9. Is it possible that \( p(x) \leq 13 \) for all \( x \)? Why or why not?

   No, 9 is an odd number and polynomials of odd degree always have range \((-\infty, \infty)\).
   But if \( p(x) \leq 13 \) for all \( x \), then \( p(x) \) doesn't have range \((-\infty, \infty)\).

2. Give the domain of the following functions.

   (a) \( f(x) = x - 13 \)  
   all real numbers

   (b) \( g(x) = (\sqrt{x - 13})^2 \) 
   \( \forall x \mid x \geq 13 \) or \( [13, \infty) \)
   (we can't take the square root of a negative number)

   (c) \( h(x) = \frac{x^2 - 169}{x + 13} \) 
   \( \forall x \mid x \neq -13 \)
   or
   all real numbers except -13
   (we can't divide by 0)
3. Write a possible formula for \( f(x) \), the piecewise function graphed below.

\[
\begin{align*}
 f(x) &= \begin{cases} 
 \sin x & \text{if } -2\pi \leq x < 0 \\
 \log_{13} x & \text{if } 0 < x
\end{cases}
\]

we know this is 13 because the point \((13,1)\) is on the graph.

4. Consider the graph of \( f(x) \) above. For which values of \( x \) is \( f(x) \) concave down?

\((-2\pi, -\pi) \text{ and } (0, \infty)\)