**Refresh** Modulus function

The **modulus** of a real number (also known as its **magnitude** or **absolute value**) is its ‘distance from zero’, or its ‘value without its sign’. The modulus of a real number \(x\) is denoted by \(|x|\). So for example, \(|-7| = 7\) and \(|7| = 7\). The **modulus function** is \(f(x) = |x|\). So the graph of the modulus function is the same as the graph of \(y = x\) when \(x \geq 0\), and the same as the graph of \(y = -x\) when \(x < 0\). The graph of \(f(x) = |x|\) is shown in Figure 1. The image set is \([0, \infty)\).

![Figure 1](image)

**Activity 1**  **Graphs involving the modulus**

Without constructing a table of values, sketch the graphs of each of the following functions.

(a) \(f(x) = |x|^3 \quad (-1 \leq x \leq 1)\)  
(b) \(f(x) = \frac{1}{|x|}\)

**Solution**

(a) Since 

\[
|x|^3 = \begin{cases} 
  x^3, & \text{if } x \geq 0, \\
  (-x)^3, & \text{if } x < 0, 
\end{cases}
\]

we can sketch the graph of the function \(f(x) = |x|^3 \quad (-1 \leq x \leq 1)\).

![Graph of \(y = |x|^3\)](image)

(b) Since 

\[
\frac{1}{|x|} = \begin{cases} 
  \frac{1}{x}, & \text{if } x > 0, \\
  \frac{1}{-x}, & \text{if } x < 0, 
\end{cases}
\]

we can sketch the graph of \(f(x) = 1/|x|\).

![Graph of \(y = 1/|x|\)](image)