

Exponential Functions

In this lesson we will review exponential functions and explore the number e .

Exponential functions have the form $f(x) = b^x$ for some positive constant b .

For what values of x can we evaluate b^x ?

- If $x = n$, a positive integer, then $b^n =$
- If $x = 0$, then $b^0 =$
- If $x = -n$, then $b^{-n} =$
- If x is a rational number, $x = \frac{p}{q}$, where p and q are integers and $q > 0$, then
$$b^{p/q} =$$
- What do we do if x is an irrational number?

Example 1: Sketch the graphs of $y = 2^x$ and $y = \left(\frac{1}{2}\right)^x$. How are the graphs related?

Example 2: Sketch the graph of $f(x) = -3^x + 2$. What is its domain and range?

Exponent Rules: If a and b are positive real numbers, and x and y are any real numbers:

$$b^{x+y} =$$

$$b^{x-y} =$$

$$(b^x)^y =$$

$$(ab)^x =$$

The Number e : e is an irrational number which is approximately $e \approx 2.71828$. The function $f(x) = e^x$ is called the **natural exponential function** and has an important property for calculus.

