

## 4.1: Exponential Functions

**Definition:** An *exponential function* is a function of the form  $f(x) = a^x$ ,  $a > 0$ .

**Graph and Graphical Properties of  $f(x) = a^x$ :**

Properties of exponential functions:

Using the definition of the derivative, we see that  
 $f'(x) =$

**Definition:**  $e$  is the number such that

*Examples:*

Compute the following limits:

$$\lim_{x \rightarrow -4^-} e^{1/(x+4)}$$

$$\lim_{x \rightarrow -\infty} \frac{4^x + 4^{-x}}{4^x - 4^{-x}}$$

Find the first and second derivatives of  $f(x) = e^{\sqrt{x^2+1}}$

A *differential equation* is an equation involving an unknown function and one or more of its derivatives. Show that the function  $y = 2e^{-3x}$  is a solution to the differential equation  $y' = -3y$

**On Your Own:** #3, 6, 7, 10, 17, 21, 25, 27, 29, 31, 35, 43, 47, 49, 59