1 4.1: Exponential Functions

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 limit definition of the derivative, we see that, if \( f(x) = a^x \),

**Definition:** \( e \) is the number such that

**Examples:**

Compute \( \lim_{x \to 2} e^{-x/(x-2)^2} \)
Find the horizontal asymptotes of \( f(x) = \frac{e^{3x} - e^{-3x}}{e^{3x} + e^{-3x}} \).

**DERIVATIVE DRILL Maplet**

A **differential equation** is an equation involving an unknown function and its relationship to one or more of its derivatives.

**On Beyond Average**: If \( y = x^2 e^x \), find the value of \( y''' - 3y'' + 3y' - y \).