Section 1.5 : Exponential Functions

Chapter 1 : Functions

Math 1551, Differential Calculus

1.5 Exponential Functions

Topics

We will cover these topics in this section.

1. Exponential functions
2. Exponent rules
3. Exponential growth and decay

Learning Objectives

For the topics in this section, students are expected to be able to:

1. Sketch functions.
2. Determine whether a graph is a function.
3. Characterize functions using domain and range, symmetry, intervals of increasing/decreasing.

Example 1

$1000 is invested in a fund with an 8% interest rate, compounded annually, at the end of each year. No funds are added or removed from the investment over a 10 year period. Give a formula for the amount in the investment after x years.

Exponent Rules

Suppose a and b are positive real numbers, x and y are real numbers.

$$a^x \cdot a^y =$$

$$\frac{a^x}{a^y} =$$

$$(a^x)^y =$$

Additional Examples (if time permits)

a) Use the laws of exponents to simplify $(81^{1/8})^{-4}$.

b) Give an expression for an exponential function, $f(t)$, that satisfies $f(0) = 1$, $f(1) = 0.5$.

Additional Example (if time permits)

Lab experiments indicate that some atoms emit a part of their mass as radiation. If N_0 is the number of nuclei present at time zero, the number still present at any later time t will be

$$N(t) = N_0 e^{-rt}, r > 0$$

The number r is the **decay rate** of the radioactive substance.

For Carbon-14, the decay rate has been determined to be about 1.2×10^{-4} when t is in years. Predict the percent of Carbon-14 present after 1000 years have elapsed in terms of N_0.