

LESSON 6: EXPONENTIAL FUNCTIONS

Objectives: 1. To review properties of exponents
2. To explore exponential functions as they pertain to growth and decay

Properties of Exponents

If $a > 0$ and $b > 0$, then:

$$a^n = a \cdot a \cdot a \cdot a \dots a, n \text{ factors}$$

$$a^0 = 1$$

$$a^{-n} = \frac{1}{a^n}$$

$$a^m a^n = a^{m+n}$$

$$\frac{a^m}{a^n} = a^{(m-n)}$$

$$(ab)^m = a^m b^m$$

$$(a^m)^n = a^{mn}$$

$$a^{\frac{m}{n}} = (a^m)^{\frac{1}{n}} = \left(a^{\frac{1}{n}}\right)^m = \sqrt[n]{a^m} = \left(\sqrt[n]{a}\right)^m$$

The Number e

$$e = \lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^x = \lim_{x \rightarrow 0} (1 + x)^{\frac{1}{x}} \approx 2.718281828$$

Growth and Decay Model

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

Compounding Continuously

$$y = Pe^{rt}$$

Problem

1. Complete the chart below

Equation	Sketch	Domain	Range	Other Properties
$y = a^x, a > 1$				
$y = a^x, a = 1$				
$y = a^x, 0 < a < 1$				
$y = a^x, a = 0$				
$y = a^x, a < 0$				
$y = a^{-x}, a > 1$				
$y = a^{x^2}, a > 1$				
$y = a^{-x^2}, a > 1$				
$y = -a^x, a > 1$				