



ALGEBRA 4

Day 72



Bell Work: How would you solve the following?

$$12 = 2x - 4$$

$$12 = x^2 - 4$$

$$12 = 2^x - 4$$

7.1 Exploring Exponential Models

7.2 Properties of Exponential Functions

■ Objectives:

Model Exponential Growth and Decay

Evaluate exponential functions with base a (and base e)

Exponential and Logarithmic Functions

Exponential Function: *a function with a variable as exponent*

$$f(x) = ab^{x-h} + k$$

where $b > 0, b \neq 1$
and x is any real number

h and k represent horizontal and vertical shifts

7.1 Exploring Exponential Models

Objective: Model Exponential Growth and Decay

$$y = ab^x$$

If $a > 0$ and $b > 1$, the function represents exponential growth

If $a > 0$ and $0 < b < 1$, the function represents exponential decay

Growth or Decay

$$0.5(1.6)^x$$

$$1.6(0.5)^x$$

$$6^x$$

$$0.9\left(\frac{1}{5}\right)^x$$

$$0.42\left(\frac{7}{5}\right)^x$$

$$7.1(1 - 0.6)^x$$

Exponential Growth and Decay Formula

Exponential Growth

$$A(t) = a(1 + r)^t$$

A(t) is the amount after t years

a is the initial amount

r is the rate (written as a decimal)

t is the time

Exponential Decay

$$A(t) = a(1 - r)^t$$

Example: Write an exponential model and answer the question.

- A population of 80,750 grows by 4.2% per year. What will the new population be after 12 years?
- You have \$4,500 in an account that decays by 8.54% per year. How much will be in the account after 7 years?

Example: Graph and determine if growth or decay

$$f(x) = 0.2(4.6)^x$$

$$f(x) = 4.1(0.6)^x$$

7.2 Properties of Exponential Functions

Objective: Evaluate exponential functions with base a (and base e)

Natural Base e: $e \approx 2.718281828 \dots$

$$f(x) = \log_e x = \ln x \quad \text{when } x > 0$$

Compound Continuously Formula

$$A(t) = Pe^{rt}$$

A(t) is the amount after t years

r is the rate (written as a decimal)

P is the initial amount

t is the time

Example: Solve

A population of 120,750 grows continuously at 5.3%.
What will the new population be after 6 years?

For Next Time...

Page 439 # 1, 3, 5, 7, 8, 26

Page 447 # 17, 19, 29, 32