

Continue

Exponential Growth and Decay

Mathematical Formulas

Exponential Growth:  $y = a(1+r)^t$

Exponential Decay:  $y = a(1-r)^t$

Graphs showing exponential growth and decay curves.

Grids for graphing.



**Exponential Functions: Domain and Range**

Name: \_\_\_\_\_ Period: \_\_\_\_\_ Date: \_\_\_\_\_

- Exponential function:  $y = ab^x$
- Domain: When there are no endpoints, assume the function keeps going. D: All Real Numbers.
- Range: The function gets close to the horizontal "asymptote" line but never touches it. R:  $y >$  number

**Examples**

<p>1</p> <p>Domain: All Real Numbers</p> <p>Range: <math>y &gt; 0</math></p>	<p>2</p> <p>Domain: All Real Numbers</p> <p>Range: <math>y &gt; 0</math></p>	<p>3</p> <p>Domain: All Real Numbers</p> <p>Range: <math>y &gt; 0</math></p>
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**Exercises**

<p>4</p> <p>Domain: All Real Numbers</p> <p>Range: <math>y &gt; 0</math></p>	<p>5</p> <p>Domain: All Real Numbers</p> <p>Range: <math>y &gt; 0</math></p>	<p>6</p> <p>Domain: All Real Numbers</p> <p>Range: <math>y &gt; 0</math></p>
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College Mathematics

Exponential Growth/Decay Continued

When a real-life quantity increases or decreases by a fixed rate EACH year (or other time period), the amount  $y$  of the quantity after  $t$  years can be modeled by the equation  $y = a(1+r)^t$  where  $a$  is the initial amount and  $r$  is the percent increase/decrease expressed as a decimal. Note that the quantity  $1+r$  is the growth/decay factor.

**Examples**

- In 1970, the population of Kern County, California was about 330,000. From 1970 to 2000, the county population grew at an average annual rate of about 2.4%.
  - Write an exponential growth model giving the population  $P$  of Kern County  $t$  years after 1970.
  - Predict what the population should be in 2005 according to the model you just created.
- In the exponential growth model  $y = 5270.39t$ , identify the initial amount, the growth factor, and the percent increase.
- A new car costs \$25,000. The value of the car decreases by 15% each year.
  - Write an exponential decay model giving the car's value  $y$  (in dollars) after  $t$  years.
  - Estimate the value of the car after 4 years.

**HOMEWORK**

- In 1990, the population of Austin, Texas, was 694,290. During the next 10 years, the population increased by about 3% each year.
  - Write a model giving the population  $P$  (in thousands) of Austin  $t$  years after 1990.
  - What was the population in 2000?















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