Chapter 7 Exponential Logarithmic Functions

7.0 Pre-assessment

Match each of the vocabulary terms on the left with the appropriate letter and definition on the right.

1. exponent.
2. function.
3. relation.
4. variable.

A. a symbol used to represent one or more numbers.

B. the set of counting numbers and their opposites

C. a relation with at most one y-value for each x-value.

D. the number of times the base of a power is used as a factor.

E. a set of ordered pairs.

Simplify each expression.

5. $x^2(x^3)(x)$
6. $3y^{-1}(5x^2y^2)$
7. $\dfrac{a^{-2}b^3}{a^4b^{-1}}$.
8. $(3x)^2(4x^3)$

Use the simple interest formula, $I = Prt$, where I is the interest, P is the initial amount (principal), and r is the interest rate..

9. Find the simple interest on an investment of \$3000 at 3% for 2 years..

10. A savings account of \$2000 earned \$90 simple interest in 3 years. Find the interest rate.

Solve each equation for x.

11. $\dfrac{x}{2} = 3y - 4$
12. $y = \dfrac{3}{4}x - \dfrac{1}{2}$

1. D 2. C 3. E 4. A 5. x^6 6. $15x^2y$ 7. b^4/a^6 8. $36x^5$ 9. \$180

10. 1.5% 11. $6y - 8$ 12. $(4y - 2)/3$

7.1 Exponential Functions, growth and Decay

Objective: Write and evaluate exponential expressions to model ggrowth and decay situations.

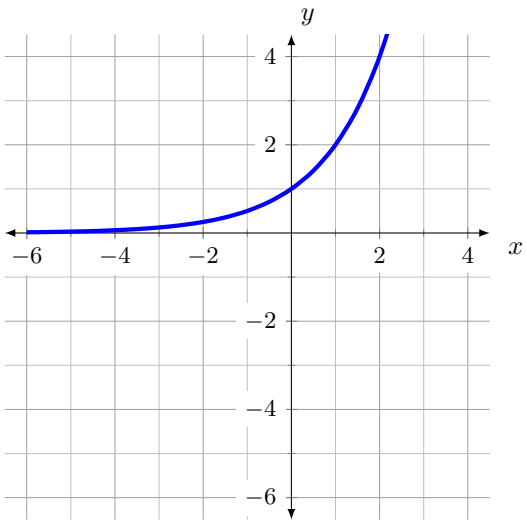
Moore's law, a rule used in the computer industry, states that the number of transistors per integrated circuit (the processing power) doubles every year. Beginning in the early days of integrated circuits, the growth in capacity may be approximated by this table.

Transistors per Integrated Chip							
Year	1965	1966	1967	1968	1969	1970	1971
Transistors	60	120	240	480	960	1920	3840
		$\times 2$	$\times 2$	$\times 2$	$\times 2$	$\times 2$	$\times 2$

Definition 7.1.1. Functions with a variable exponent is known as an **exponential function**. The parent exponential function is $f(x) = b^x$, where the **base** b is a constant and the exponent x is the independent variable.

$$f(x) = b^x, \text{ where } b > 0 \ , b \neq 1.$$

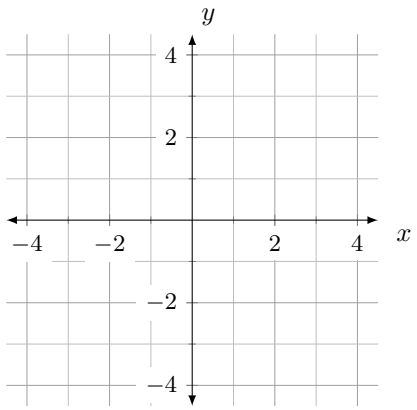
x	-2	-1	0	1	2	3
$\mathbf{f(x) = 2^x}$						



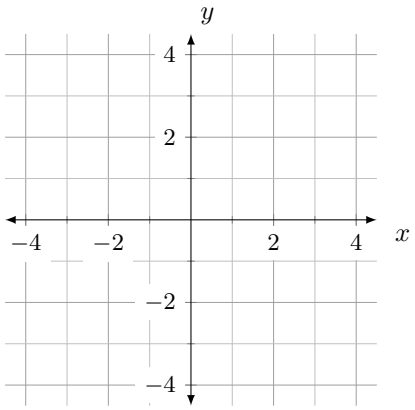
Definition 7.1.2. An **asymptote** is a line that a graphed function approaches as the value of x gets very large or very small. A function of the form $f(x) = ab^x$, with $a > 0$ and $b > 1$, is an **exponential growth** function, which increases as x increases. When $0 < b < 1$, the function is called an **exponential decay** function, which decreases as x increases.

Example 1. Tell whether the function shows growth or decay. Then graph.

(a) $f(x) = 3^x$

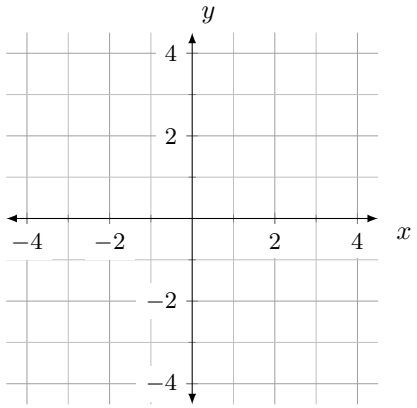


(b) $g(x) = 2\left(\frac{1}{2}\right)^2$

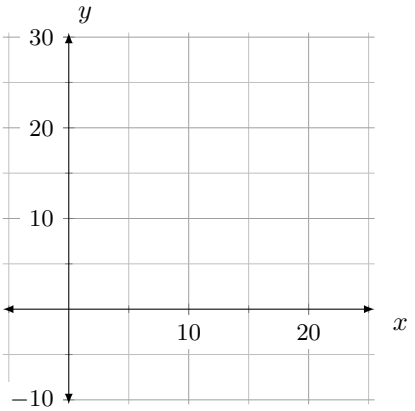


Example 2. Use a table and graphing calculator to sketch the exponential functions. Tell whether the function shows growth or decay.

(a) $f(x) = 1.5^x$



(b) $g(x) = 30(0.8^x)$



Exponential Growth Model

$$A(x) = P(1 \pm r)^t$$

Where A is the final amount, P is the principal (initial amount), r is the rate of increase or decrease, and t is time in compounding periods.

Example 3. (Calculator) Tyler purchased a rare 1959 Gibson Les Paul guitar in 2000 for \$12,000. Experts estimate that its value will increase by 14% per year. Use a calculator to graph to find when the value of the guitar will be 60,000.

7.1 (day 1) Homework: page

Exponential Functions (day 2)

Objective: Write and evaluate exponential expressions to model ggrowth and decay situations.

You Try It! 1.

(a)

(b)

Example 4.

(a)

(b)

Example 5.

(a)

(b)

(c)

(d)

7.1 (day 2) Homework: page

7.2 Inverse of Relations and Functions

Objective: Graph and recognize inverses of relations and functions. Find Inverses of functions

Example 1.

(a)

(b)

Example 2.

(a)

(b)

Example 3.

7.2 Homework (day 1): page

7.3 Logarithmic Functions

Objective: Write equivalent forms for exponential and logarithmic functions.

Example 1.

(a)

You Try It! 2.

(b)

Example 2.

(a)

(b)

Example 3.

(a)

(b)

Example 4.

(a)

(b)

7.3 (day 1) Homework: page

7.3 (day 2)

Objective: Write, evaluate, and graph logarithmic functions.

You Try It! 3.

(a)

(b)

Example 5.

(a)

(b)

Example 6.

(a)

(b)

7.3 (day 2) Homework: page

7.4 Properties of Logarithms

Objective: Use properties to simplify logarithmic expressions.

Example 1.

(a)

(b)

Example 2.

(a)

(b)

You Try It! 4.

(a)

(b)

7.4 (day 1) Homework: page

7.4 (day 2) Properties of Logarithms

Objective: Translate between logarithms in any base.

Example 3.

(a)

(b)

You Try It! 5.

(a)

(b)

7.4 (day 2) Homework: page

7.6 The Natural Base, e

Objective: Use the number e to write and graph exponential functions representing real-world.

Example 1.

(a)

(b)

You Try It! 6.

(a)

(b)

Definition 7.6.1.

Example 2.

(a)

(b)

7.6 Homework (day 1): page

7.6 The Natural Base, e (day 2)

Objective: Solve equations and problems involving e or natural logarithms.

Example 3.

Example 4.

(a)

(b)

7.6 Homework (day 2): page

7.7 Transforming Exponential and Logarithmic Functions

Objective: Transform exponential and logarithmic functions by changing parameters..

Example 1.

(a)

(b)

Example 2.

(a)

(b)

7.7 Homework (day 1): page

7.7 Transforming Exponential and Logarithmic Functions (day 2)

Objective: Describe the effects of changes in the coefficients of exponential and logarithmic functions.

Example 3.

(a)

(b)

Example 4.

Example 5.

7.7 Homework (day 2): page

Chapter 7 Review (day 1)

1. .

2. .

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Ch 7 Review (day 2)