

Math 30-2: U6L1 Teacher Notes

Exponential Functions

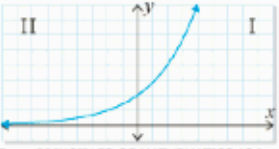
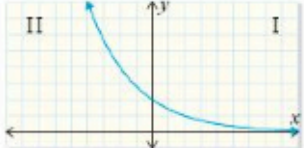
Key Math Learnings:

By the end of this lesson, you will learn the following concepts:

- ★ Describe, orally and in written form, the characteristics of exponential functions by analyzing their graphs.

What is an Exponential Function?

The formal mathematical notation of an exponential function is written as $f(x) = a(b)^x$, where $a \neq 0$, $b > 0$, and $b \neq 1$. When we graph an exponential function of this form the graph can follow one of two shapes. The shape depends on the value of b .

<p>Exponential Growth</p>	<p>Increasing</p>  <p>From <i>PRINCIPLES OF MATHEMATICS 12</i> by Cavanagh-McGrath et al. Copyright Nelson Education Ltd. Reprinted with permission. This graph shows $y = bx$, $b > 1$.</p>	<ul style="list-style-type: none"> • the graph increases from quadrant II to quadrant I • b is greater than 1
<p>Exponential Decay</p>	<p>Decreasing</p>  <p>From <i>PRINCIPLES OF MATHEMATICS 12</i> by Cavanagh-McGrath et al. Copyright Nelson Education Ltd. Reprinted with permission. This graph shows $y = b^x$, $0 < b < 1$.</p>	<ul style="list-style-type: none"> • the graph decreases from quadrant II to quadrant I • b is greater than 0 but less than 1

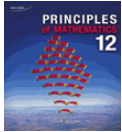
Characteristics of an Exponential Functions

All exponential functions of the form, where $a \neq 0$, $b > 0$, and $b \neq 1$ have the following characteristics:

- Number of x - intercepts: 0
- y - intercept: $(0, a)$
- Domain: $\{x \mid x \in R\}$
- Range: $\{y \mid y > 0, y \in R\}$



Click the icon to watch a Youtube video on Properties of an Exponential Function

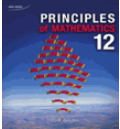


Practice Problem:

Complete "Furthering your Understanding" question 1 on page 337 of your textbook.

Solution:

- a. linear function
- b. exponential function
- c. quadratic function
- d. cubic function
- e. exponential function
- f. quadratic function



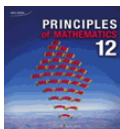
Practice Problem:

Complete “Furthering your Understanding” question 2 on page 337 of your textbook.

Solution:

- a. There is no x -intercept. The y -intercept is 1. The graph extends from quadrant II to quadrant I. The domain is $\{x|x \in \mathbb{R}\}$. The range is $\{y|y > 0, y \in \mathbb{R}\}$.

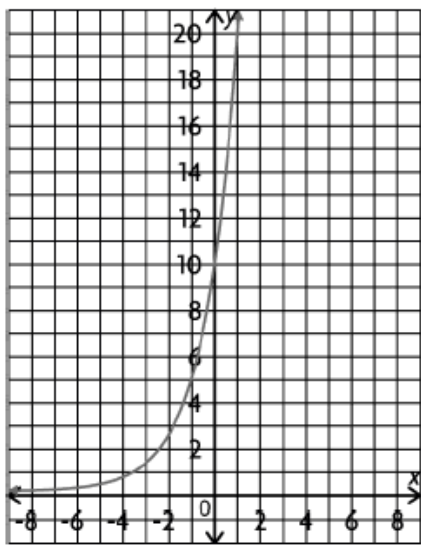
- b. There is no x -intercept. The y -intercept is 1. The graph extends from quadrant II to quadrant I. The domain is $\{x|x \in \mathbb{R}\}$. The range is $\{y|y > 0, y \in \mathbb{R}\}$.

**Practice Problem:**

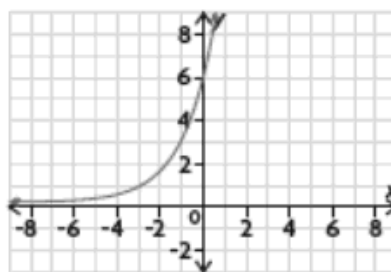
Complete “Furthering your Understanding” question 3 on page 337 of your textbook.

Solution:

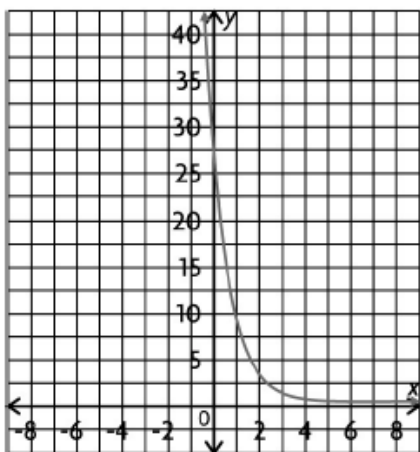
3. a) Number of x-intercepts: 0;
 y-intercept: $y = 10$
 Domain: $\{x \mid x \in \mathbb{R}\}$; Range: $\{y \mid y > 0, y \in \mathbb{R}\}$
 End Behaviour: QII to QI



b) Number of x-intercepts: 0
 y-intercept: $y = 6$
 Domain: $\{x \mid x \in \mathbb{R}\}$
 Range: $\{y \mid y > 0, y \in \mathbb{R}\}$
 End Behaviour: QII to QI



c) Number of x-intercepts: 0
y-intercept: $y = 27$
Domain: $\{x \mid x \in \mathbb{R}\}$; Range: $\{y \mid y > 0, y \in \mathbb{R}\}$
End Behaviour: QII to QI



d) Number of x-intercepts: 0
y-intercept: $y = 4$
Domain: $\{x \mid x \in \mathbb{R}\}$
Range: $\{y \mid y > 0, y \in \mathbb{R}\}$
End Behaviour: QII to QI

