Review Exercise Set 7

Exercise 1: Approximate the value of each exponential expression.

a) e^3 b) e^0 c) $e^{1/4}$

Exercise 2: Find the y-intercept and horizontal asymptote for the following exponential function.

$f(x) = e^{-0.1x + 2} + 2$

Exercise 3: Find the y-intercept and horizontal asymptote for the following exponential function.

$f(x) = e^{x/2}$

Exercise 4: Sketch the graph of the following exponential function by locating the asymptote, y-intercept, and other points on the graph.

$$f(x) = e^{-x} - 3$$

Exercise 5: A small town with 10,000 residents has been experiencing an increase in their population at a rate of 3% a year. If this growth in population continues how many residents will the town have in 10 years? (Hint: $N = N_0e^{rt}$)

Review Exercise Set 7 Answer Key

Exercise 1: Approximate the value of each exponential expression.

a) e^3 b) e^0 c) $e^{1/4}$

a) $e^3 \approx 2.718^3 \approx 20.09$

b) $e^0 = 1$

c) $e^{1/4} = \sqrt[4]{e} \approx 1.28$

Exercise 2: Find the y-intercept and horizontal asymptote for the following exponential function.

$f(x) = e^{-0.1x + 2} + 2$

Y-intercept

let x = 0

$f(x) = e^{-0.1x + 2} + 2$
$f(0) = e^{-0.1(0) + 2} + 2$
$f(0) = e^2 + 2$
$f(0) \approx 7.39 + 2$
$f(0) \approx 9.39$

The y-intercept is approximately located at (0, 9.4)

Horizontal asymptote

For the base function e^x the horizontal asymptote is the x-axis (y = 0). The given function for f(x) contains a vertical shift of +2. Therefore, the horizontal asymptote will be shifted up 2 units to y = 2.

The horizontal asymptote is at y = 2

Exercise 3: Find the y-intercept and horizontal asymptote for the following exponential function.

$f(x) = e^{x/2}$

Y-intercept

let x = 0

$f(x) = e^{x/2}$
$f(0) = e^{0/2}$
$f(0) = e^{0}$
$f(0) = 1$

The y-intercept is located at (0, 1)

Horizontal asymptote

For the base function e^{x} the horizontal asymptote is the x-axis (y = 0). The given function for f(x) does not contain a vertical shift so the horizontal asymptote will remain at the x-axis.

The horizontal asymptote is at y = 0

Exercise 4: Sketch the graph of the following exponential function by locating the asymptote, y-intercept, and other points on the graph.

$f(x) = e^{-x} - 3$

Y-intercept

let x = 0

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

The y-intercept is located at (0, -2)

Horizontal asymptote

For the base function e^{x} the horizontal asymptote is the x-axis (y = 0). The given function for f(x) has a vertical shift of -3 so the horizontal asymptote will be shifted downward 3 from the x-axis.

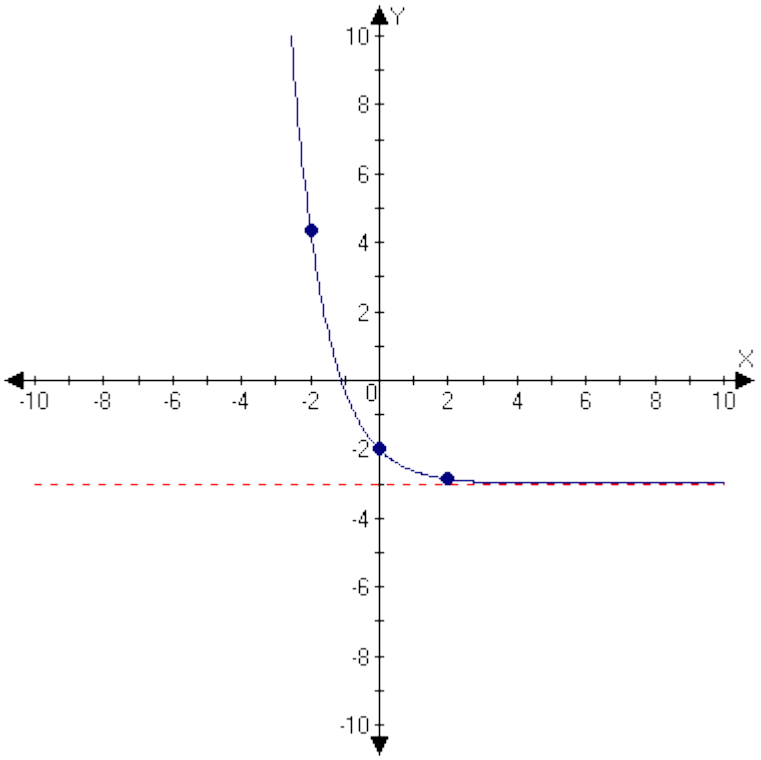
The horizontal asymptote is at y = -3

Exercise 4 (Continued):

Additional points

let x = -2	let x = 2
$f(x) = e^{-x} - 3$	$f(x) = e^{-x} - 3$
$f(-2) = e^{-(-2)} - 3$	$f(2) = e^{-(2)} - 3$
$f(-2) = e^{2} - 3$	$f(2) = e^{-2} - 3$
$f(-2) \approx 7.389 - 3$	$f(2) \approx 0.135 - 3$
$f(-2) \approx 4.389$	$f(2) \approx -2.865$
(-2, 4.4)	**(2, -2.9)**

Graph



Exercise 5: A small town with 10,000 residents has been experiencing an increase in their population at a rate of 3% a year. If this growth in population continues how many residents will the town have in 10 years? (Hint: $N = N_0e^{rt}$)

Identify given information

$N_0 = 10000$
$r = 3\% = 0.03$
$t = 10$

Substitute the given data into the formula to solve for the unknown value.

$N = N_0e^{rt}$
$N = (10000)e^{(0.03)(10)}$
$N = 10000e^{0.3}$
$N \approx 10000(1.34985)$
$N \approx 13498.5$

In 10 years the population will be approximately 13,499 residents.