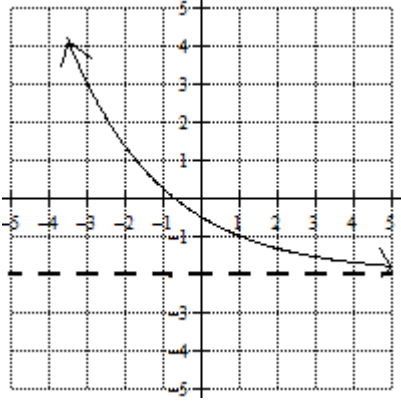
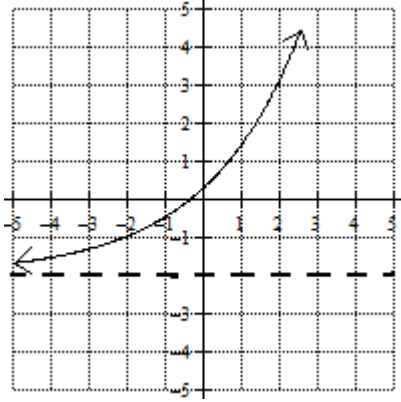
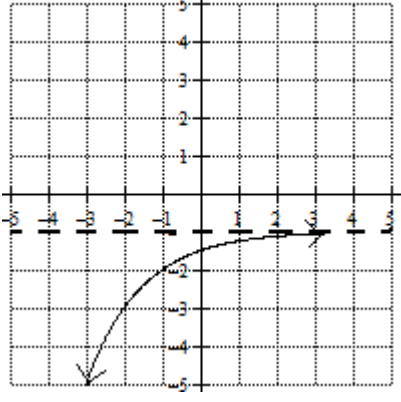
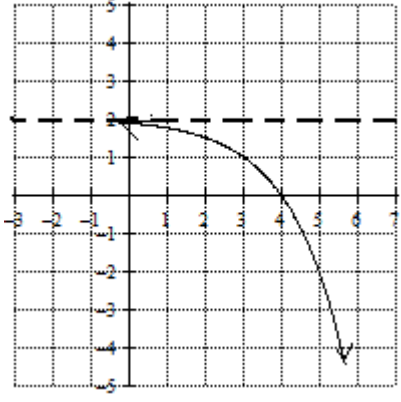


Lesson #4- Limits of Exponential Functions
Graphical and Analytical Connections

Consider the four exponential functions graphed below. Find the indicated limits for each function based on the graph.

$f(x) = \left(\frac{2}{3}\right)^{x-1} - 2$  <p> $\lim_{x \rightarrow -\infty} f(x) =$ $\lim_{x \rightarrow \infty} f(x) =$ </p>	$f(x) = \left(\frac{3}{2}\right)^{x+2} - 2$  <p> $\lim_{x \rightarrow -\infty} f(x) =$ $\lim_{x \rightarrow \infty} f(x) =$ </p>
$f(x) = -\left(\frac{1}{2}\right)^{x+1} - 1$  <p> $\lim_{x \rightarrow -\infty} f(x) =$ $\lim_{x \rightarrow \infty} f(x) =$ </p>	$f(x) = -\left(\frac{1}{2}\right)^{-x+3} + 2$  <p> $\lim_{x \rightarrow -\infty} f(x) =$ $\lim_{x \rightarrow \infty} f(x) =$ </p>

In order to determine a limit as x approaches $-\infty$ or ∞ for an exponential function, you have to determine what the graph will look like. Based on what we have seen above, what are the three possible results of such a limit for an exponential function?

By studying the graphs above, remind yourself of the four rules determining if the function will be a growth or decay function.

1. _____
2. _____
3. _____
4. _____

Determine the limits of each of the following exponential functions.

1. $\lim_{x \rightarrow \infty} \left(\frac{2}{3}\right)^{-x-1} - 2$	2. $\lim_{x \rightarrow -\infty} -(0.4)^x - 4$
3. $\lim_{x \rightarrow \infty} -\left(\frac{2}{3}\right)^{-x+2} + 3$	4. $\lim_{x \rightarrow \infty} -2^{-x-1} + 2$
5. $\lim_{x \rightarrow -\infty} e^{-x-1} + 2$	6. $\lim_{x \rightarrow \infty} -(0.4)^x - 4$
7. $\lim_{x \rightarrow 3} (e^{2-x} + 2)$	8. $\lim_{x \rightarrow -2} \left[\left(\frac{1}{2}\right)^{-x-3} + 3 \right]$

Lesson #4 Homework

Find the limit of each of the following exponential functions. Sketch a graph of each function to aid in your determination of the limit, if necessary..

<p>1. $\lim_{x \rightarrow \infty} -(0.5)^{-x-2} + 3$</p>	<p>2. $\lim_{x \rightarrow \infty} 2^{-x-2} + 3$</p>	<p>3. $\lim_{x \rightarrow -\infty} -\left(\frac{1}{4}\right)^{-x-2} + 3$</p>
<p>4. $\lim_{x \rightarrow -2} -(3)^{-x-2} + 3$</p>	<p>5. $\lim_{x \rightarrow -2} \left(\frac{1}{2}\right)^{x+2} - 1$</p>	<p>6. $\lim_{x \rightarrow -1} 2^{-x-2} + 2$</p>

7. Using the graph of $g(x)$ pictured to the right, find each of the following limits.

a. $\lim_{x \rightarrow \infty} g(x) = \underline{\hspace{2cm}}$

b. $\lim_{x \rightarrow -\infty} g(x) = \underline{\hspace{2cm}}$

c. $\lim_{x \rightarrow -1} g(x) = \underline{\hspace{2cm}}$

d. $\lim_{x \rightarrow -3} g(x) = \underline{\hspace{2cm}}$

