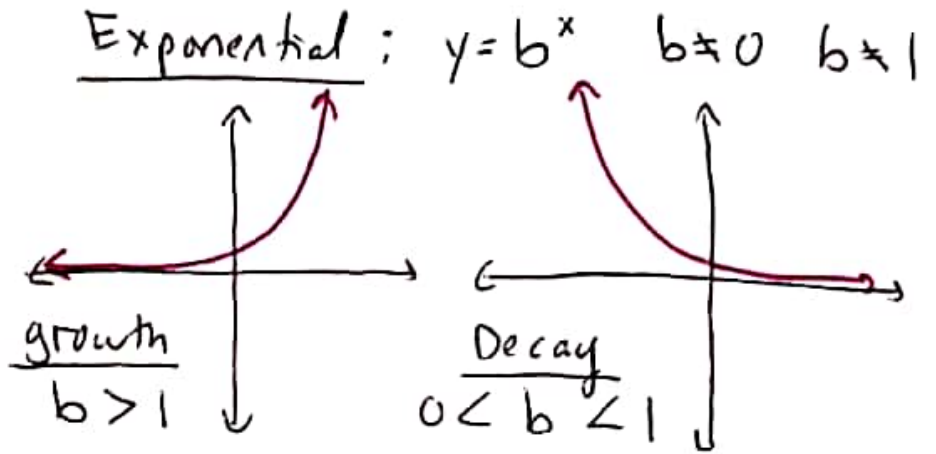
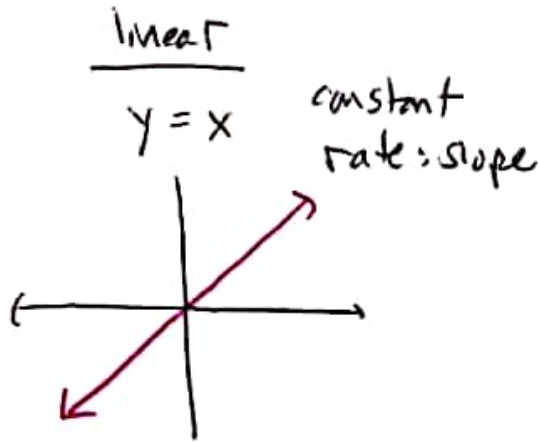


Learning Target: to graph exponential functions with transformations and discuss real world situations.

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I.) General Form of a Transformed Exponential Function

$$f(x) = a(b)^{x \pm h} \pm k$$

horizontal translation

- $a < 0$ horizontal reflection
- $a > 1$ vertical stretch
- $0 < a < 1$ vertical shrink
- $b > 1$ growth
- $0 < b < 1$ decay
- vertical translation

Examples:

a) $y = -2\left(\frac{1}{2}\right)^{x-1} + 8$ decay

b) $y = \frac{1}{2}(2)^{x+4} - 5$ growth

c) $y = 2^{-x} \Rightarrow y = 2^{-1x} \Rightarrow y = \left(\frac{1}{2}\right)^x$

II.) Steps to graph exponential functions with transformations

- 1.) Find the parent function by ignoring the horizontal and vertical translations.

$$y = 2(3)^{x+2} - 4 \longrightarrow \boxed{y = 2(3)^x}$$

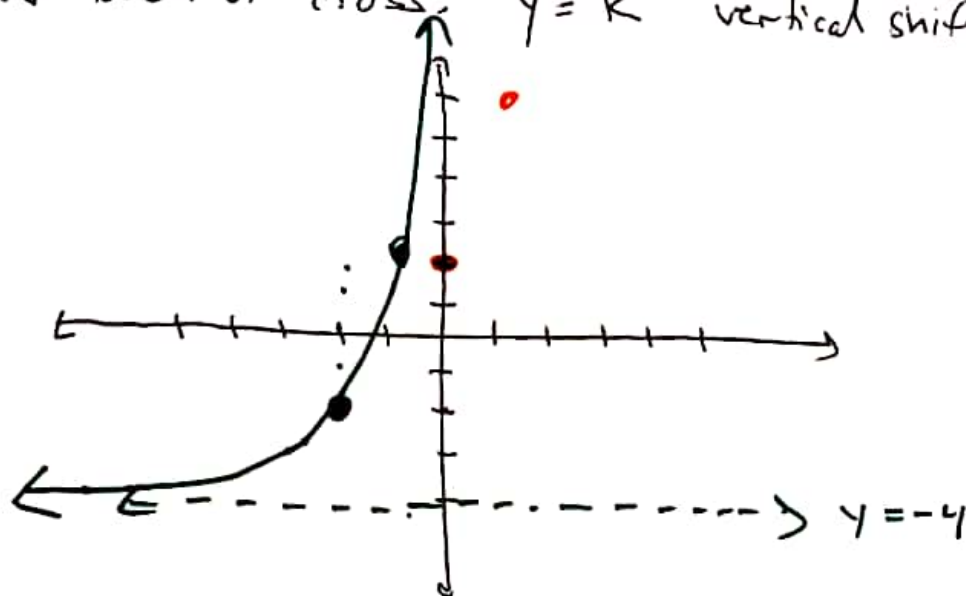
- 2.) Find helper points using parent function from step 1, by plugging in 0 and 1.

$$y = 2(3)^x \quad \boxed{(0, 2)} \quad \& \quad \boxed{(1, 6)}$$

$y = 2(3)^0$	$y = 2(3)^1$
$y = 2(1)$	$y = 2(3)$
$y = 2$	$y = 6$

- 3.) Translate helper points using horizontal and vertical translations and graph curve.

- 4.) Asymptote: an invisible line the graph can never touch or cross. $y = k$ vertical shift



Graphing Exponential Functions with Transformations

1.) $f(x) = \frac{1}{2}(2)^{x+3} - 4$

Type: Growth Decay

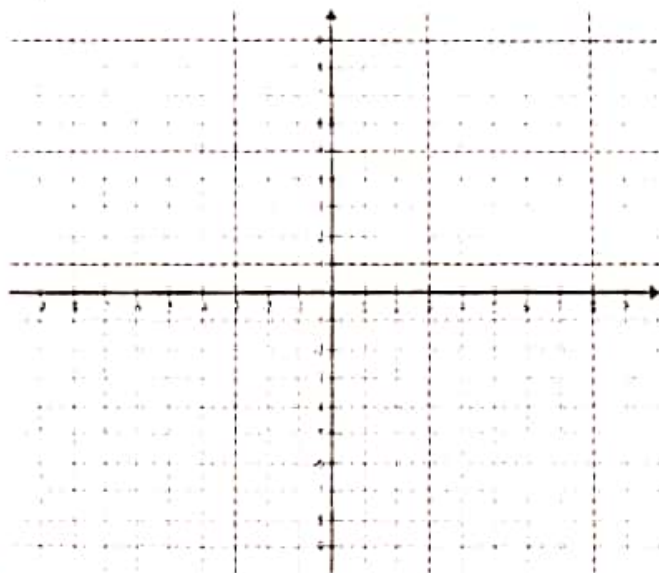
Parent Function: _____

Helper points:

x	y

Asymptote: _____

Transformations:



Domain: _____ Range: _____

2.) $f(x) = 2\left(\frac{1}{2}\right)^{x-3} + 4$

Parent Function: $y = 2\left(\frac{1}{2}\right)^x$

Helper points:

x	y
0	2
1	1

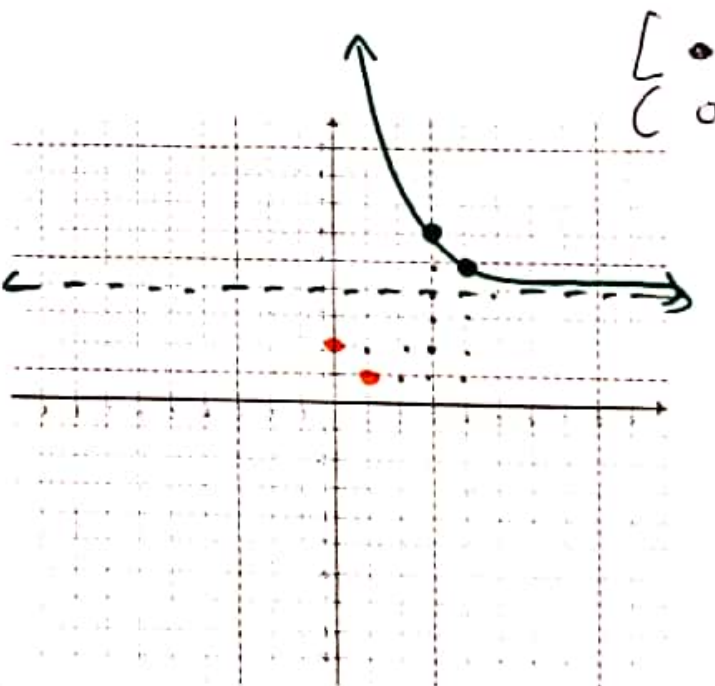
Asymptote: $y = 4$

Transformations:

vertical stretch

horizontal translation (R)

vertical translation (U)



Domain: $(-\infty, \infty)$ Range: $(4, +\infty)$

Name _____ Date _____ Per _____

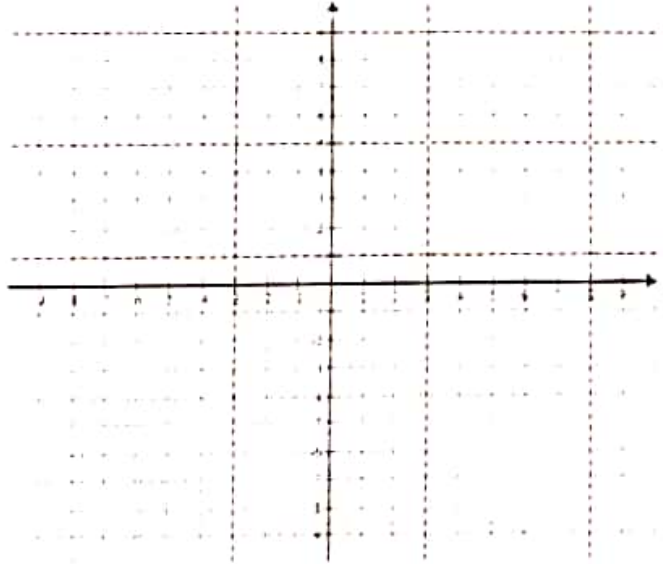
Graphing Exponential Functions with Transformations

3.) $f(x) = -(2)^{x-4} + 3$

Parent Function: _____

Helper points:

x	y



Asymptote: _____

Transformations:

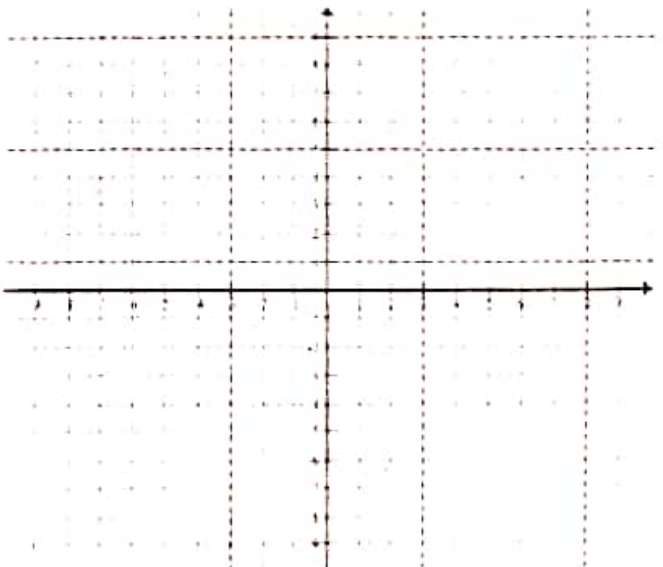
Domain: _____ Range: _____

4.) $f(x) = -3\left(\frac{1}{3}\right)^{x+1} - 2$

Parent Function: _____

Helper points:

x	y



Asymptote: _____

Transformations:

Domain: _____ Range: _____