Name: _____ Date: _____

Transformations:

$y = a \cdot (b)^{x-h} + k$

- a: stretch / shrink; negative → reflection over x-axis
- b: Growth / Decay
- h: (+) left, (-) right
- k: (+) up, (-) down

Asymptote: $y = k$ * Horizontal dashed line

Domain: $(-\infty, \infty)$ For all exponentials

Range: * use k → up + down transform.

(k, ∞)

$(-\infty, k)$ ← reflect over x

X-Int: $(\#, 0)$
- Crosses x-axis
- Sometimes n/a
* Solve → Plug 0 for y + solve for x!!

Y-Int: $(0, \#)$
- Crosses y-axis
* Solve → Plug 0 for x solve for y!

Increasing or Decreasing

Read from left → right! ( ) only using domain.

End Behavior:

Based on Domain! (always $(-\infty, \infty)$)

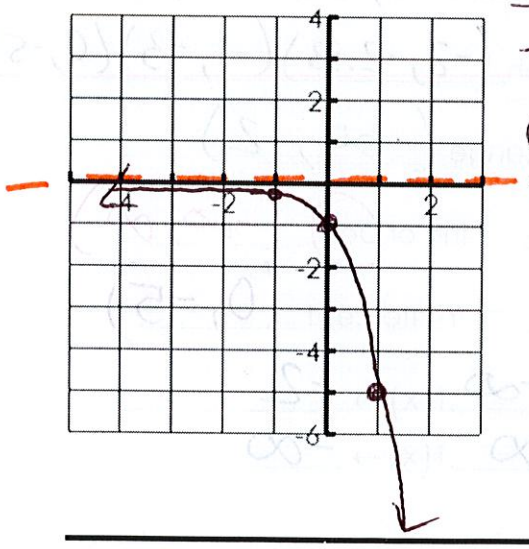
$x \to \_\_\_, f(x) \to \_\_\_$

$x \to \_\_\_, f(x) \to \_\_\_$

Based on Range either: k, ∞, -∞

1. $y = -5^x$

x	y
-1	-1/5
0	-1
1	-5



Transformations: Reflect over x-axis

State 3 points on Graph $(-1, -\frac{1}{5})$ $(0, -1)$ $(1, -5)$

Domain $(-\infty, \infty)$ Range $(-\infty, 0)$

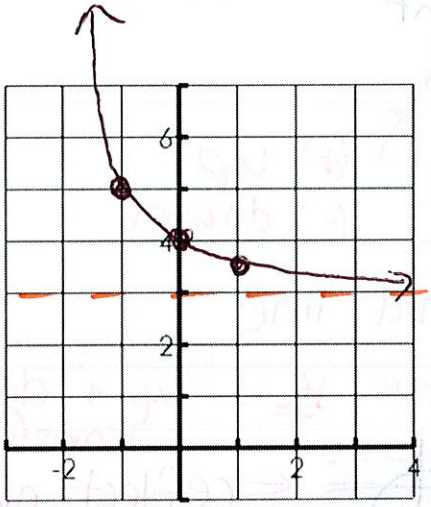
Asymptote $y = 0$ Inc or (Dec) $(-\infty, \infty)$

X-intercept n/a Y-intercept $(0, -1)$

End Behavior $x \to -\infty, f(x) \to 0$

$x \to \infty, f(x) \to -\infty$

2. $y = \left(\frac{1}{2}\right)^x + 3$ * Decay



x	y (+3)
-1	2
0	1
1	$\frac{1}{2}$

Transformations: Up 3

State 3 points on Graph (-1, 5) (0, 4) (1, 3.5)

Domain $(-\infty, \infty)$ Range $(3, \infty)$

Asymptote $y = 3$ Inc or Dec $(-\infty, \infty)$

X-intercept n/a Y-intercept (0, 4)

End Behavior $x \to -\infty$, $f(x) \to \infty$

$x \to \infty$, $f(x) \to 3$

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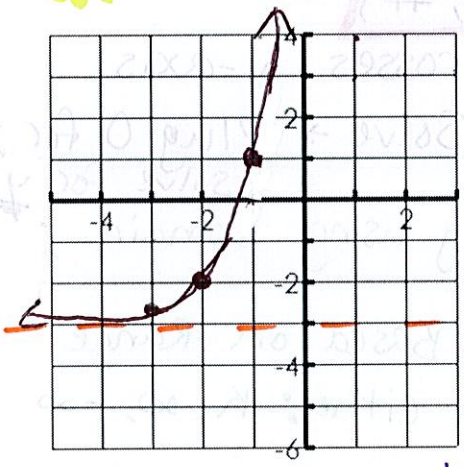
3. $y = 4^{x+2} - 3$ * Growth



x (-2)	y (-3)
-1	$\frac{1}{4}$
0	1
1	4

Transformations: left 2, down 3

State 3 points on Graph (-3, -2.75) (-2, -2) (-1, 1)

Domain $(-\infty, \infty)$ Range $(-3, \infty)$

Asymptote $y = -3$ Inc or Dec $(-\infty, \infty)$

X-intercept $(\log_4 3 - 2, 0)$ Y-intercept (0, 13)

$0 = 4^{x+2} - 3$

$3 = 4^{x+2}$

$\log_4 3 = x + 2$

End Behavior $x \to -\infty$, $f(x) \to -3$

$x \to \infty$, $f(x) \to \infty$

$y = 4^{0+2} - 3$

$y = 4^2 - 3$

$y = 16 - 3$

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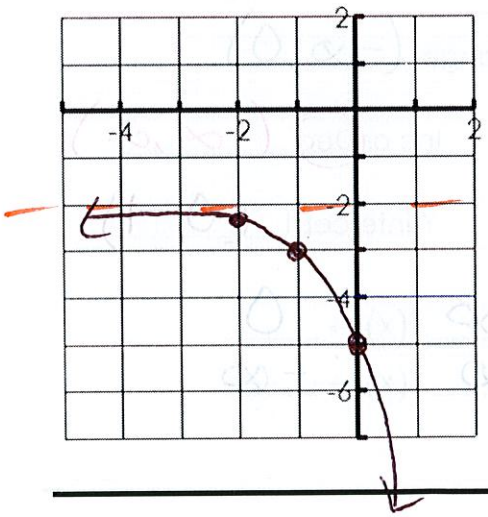
* Growth

4. $y = -3^{x+1} - 2$



x (-1)	y (-2)
-1	$-\frac{1}{3}$
0	-1
1	-3

Transformations: reflect x, left 1, down 2

State 3 points on Graph (-2, -2.33) (-1, -3) (0, -5)

Domain $(-\infty, \infty)$ Range $(-\infty, -2)$

Asymptote $y = -2$ Inc or Dec $(-\infty, \infty)$

X-intercept n/a Y-intercept (0, -5)

End Behavior $x \to -\infty$, $f(x) \to -2$

$x \to \infty$, $f(x) \to -\infty$