

## Graphing Exponential Functions

## Vocab

1) Exponential Function

$$y = ab^x \text{ where } a \neq 0,$$

2) Exponential Growth parent function

$$y = b^x \text{ where } b > 1$$

3) Exponential Decay parent function

$$y = b^x \text{ where } 0 < b < 1$$

4) Asymptote

a line the graph approaches more and more closely

\* k is HA

5) Transformations of Exponential Functions

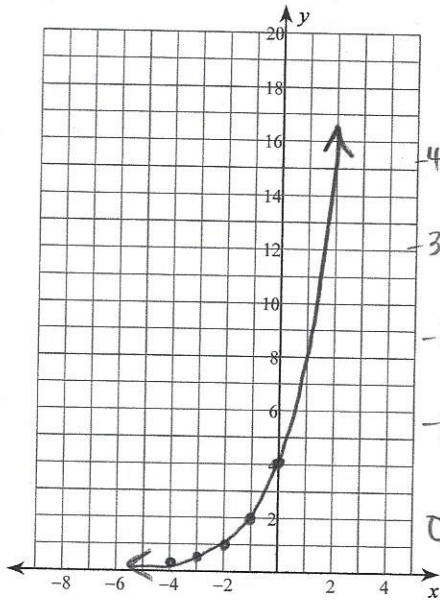
$$y = ab^{x-h} + k$$

Opposite h shifts horizontally

k shifts vertically

Graph each function. Then state the domain, range, and equation of the asymptote.

6)  $y = 2^{x+2}$

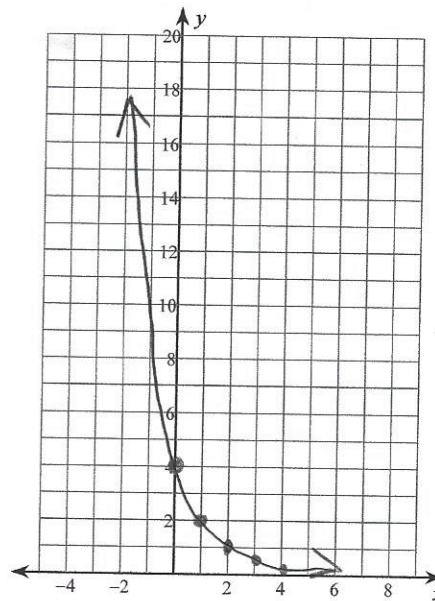


D:  $(-\infty, \infty)$   
R:  $(0, \infty)$

HA:  $y = 0$

$x$	$y$
-2	$2^{-2} = \frac{1}{4}$
-1	$2^{-1} = \frac{1}{2}$
0	$2^0 = 1$
1	$2^1 = 2$
2	$2^2 = 4$

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

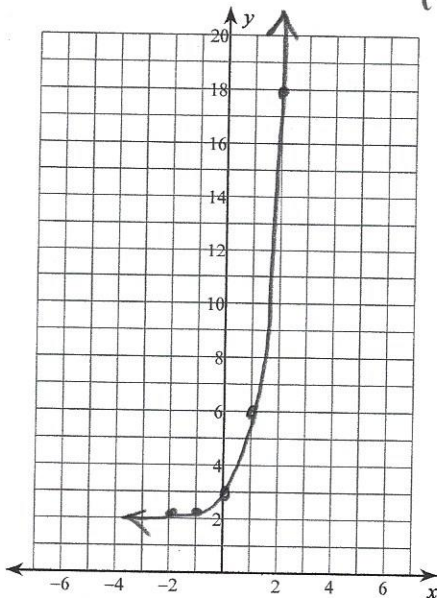


D:  $(-\infty, \infty)$   
R:  $(0, \infty)$

HA:  $y = 0$

$x$	$y$
0	$\left(\frac{1}{2}\right)^{-2} = 4$
1	$\left(\frac{1}{2}\right)^{-1} = 2$
2	$\left(\frac{1}{2}\right)^0 = 1$
3	$\left(\frac{1}{2}\right)^1 = \frac{1}{2}$
4	$\left(\frac{1}{2}\right)^2 = \frac{1}{4}$

8)  $y = 4^x + 2$

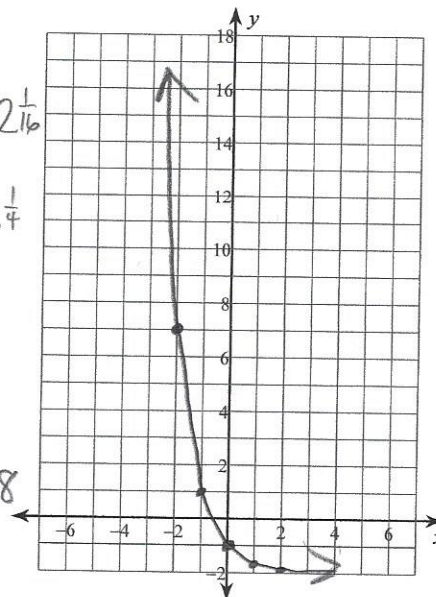


D:  $(-\infty, \infty)$   
R:  $(2, \infty)$

HA:  $y = 2$

$x$	$y + 2$
-2	$4^{-2} = \frac{1}{16} = 2\frac{1}{16}$
-1	$4^{-1} = \frac{1}{4} = 2\frac{1}{4}$
0	$4^0 = 1 = 3$
1	$4^1 = 4 = 6$
2	$4^2 = 16 = 18$

9)  $y = \left(\frac{1}{3}\right)^x - 2$

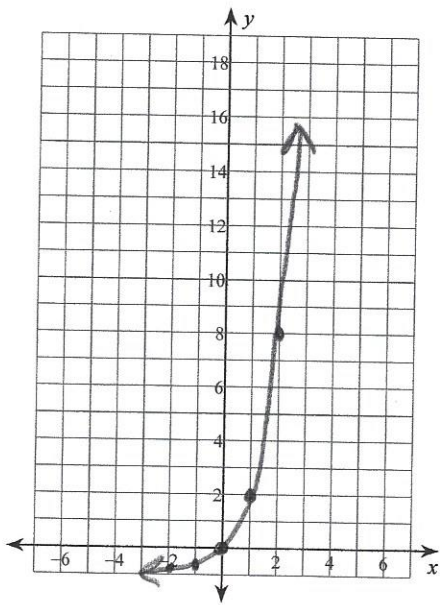


D:  $(-\infty, \infty)$   
R:  $(-2, \infty)$

HA:  $y = -2$

$x$	$y - 2$
-2	$\left(\frac{1}{3}\right)^{-2} = 9 = 7$
-1	$\left(\frac{1}{3}\right)^{-1} = 3 = 1$
0	$\left(\frac{1}{3}\right)^0 = 1 = -1$
1	$\left(\frac{1}{3}\right)^1 = \frac{1}{3} = -\frac{2}{3}$
2	$\left(\frac{1}{3}\right)^2 = \frac{1}{9} = -\frac{18}{9}$

10)  $y = 3^x - 1$



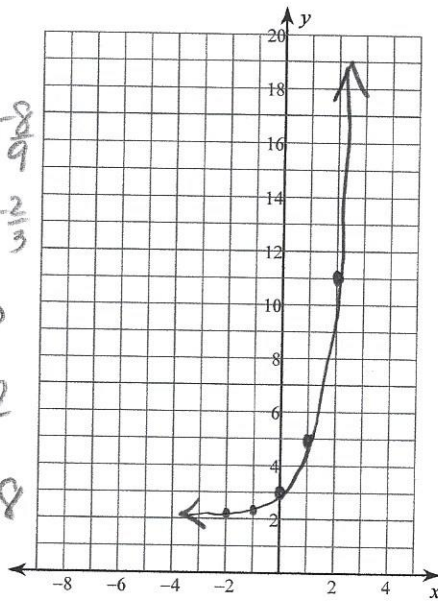
$D: (-\infty, \infty)$

$R: (-1, \infty)$

HA:  $y = -1$

11)  $y = 3^{x+2} + 2$

X	y - 1
-2	$3^{-2} = \frac{1}{9} = \frac{-8}{9}$
-1	$3^{-1} = \frac{1}{3} = \frac{-2}{3}$
0	$3^0 = 1 = 0$
1	$3^1 = 3 = 2$
2	$3^2 = 9 = 8$



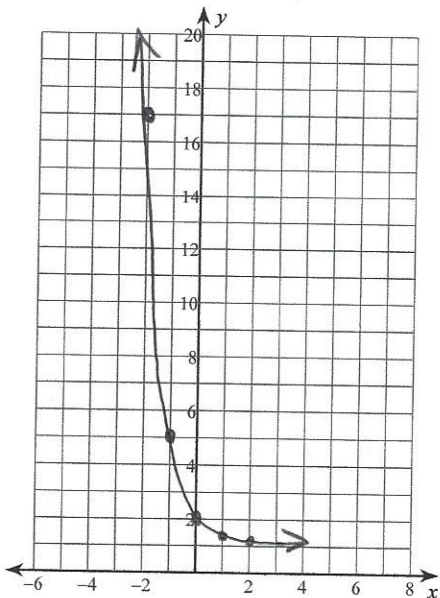
$D: (-\infty, \infty)$

$R: (2, \infty)$

HA:  $y = 2$

X	y + 2
-2	$3^{-2} = \frac{1}{9} = 2\frac{1}{9}$
-1	$3^{-1} = \frac{1}{3} = 2\frac{1}{3}$
0	$3^0 = 1 = 3$
1	$3^1 = 3 = 5$
2	$3^2 = 9 = 11$

12)  $y = \left(\frac{1}{4}\right)^{x-1} + 1$



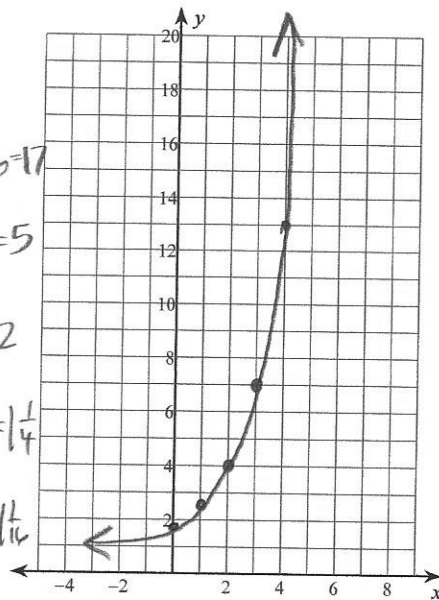
$D: (-\infty, \infty)$

$R: (1, \infty)$

HA:  $y = 1$

13)  $y = 3 \cdot 2^{x-2} + 1$

X	y + 1
-2	$\left(\frac{1}{4}\right)^{-2} = 16 = 17$
-1	$\left(\frac{1}{4}\right)^{-1} = 4 = 5$
0	$\left(\frac{1}{4}\right)^0 = 1 = 2$
1	$\left(\frac{1}{4}\right)^1 = \frac{1}{4} = 1\frac{1}{4}$
2	$\left(\frac{1}{4}\right)^2 = \frac{1}{16} = 1\frac{1}{16}$



$D: (-\infty, \infty)$

$R: (1, \infty)$

HA:  $y = 1$

X	y + 1
0 = -2	$3 \cdot 2^{-2} = \frac{3}{4} = 1\frac{3}{4}$
1 = -1	$3 \cdot 2^{-1} = \frac{3}{2} = 1\frac{1}{2}$
2 = 0	$3 \cdot 2^0 = 3 = 4$
3 = 1	$3 \cdot 2^1 = 6 = 7$
4 = 2	$3 \cdot 2^2 = 12 = 13$