F.IF.C.7: Graphing Logarithmic Functions

1 For which value of x is $y = \log x$ undefined?
  1) 0   3) π
  2) $\dfrac{1}{10}$ 4) 1.483

2 The graph of $y = \log x$ lies in Quadrant(s)
 1) I and II   3) III and IV
  2) II and III   4) I and IV

3 Which statement about the graph of $c(x) = \log_6 x$ is *false*?
  1) The asymptote has equation $y = 0$.   3) The domain is the set of positive reals.
  2) The graph has no y-intercept.   4) The range is the set of all real numbers.

4 Which statement below about the graph of $f(x) = -\log(x + 4) + 2$ is true?
  1) $f(x)$ has a y-intercept at $(0,2)$.   3) As $x \to \infty, f(x) \to \infty$.
  2) $-f(x)$ has a y-intercept at $(0,2)$.   4) $x \to -4, f(x) \to \infty$.

5 If $f(x) = \log_3 x$ and $g(x)$ is the image of $f(x)$ after a translation five units to the left, which equation represents $g(x)$?
  1) $g(x) = \log_3(x + 5)$ 3) $g(x) = \log_3(x - 5)$
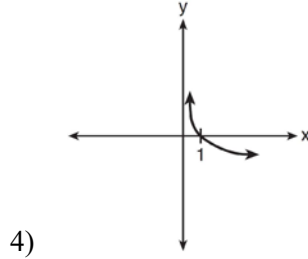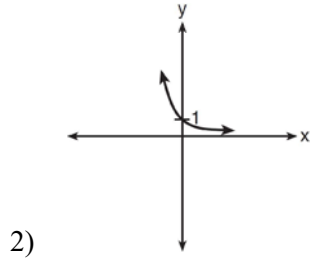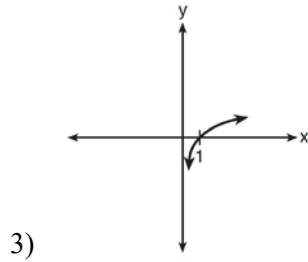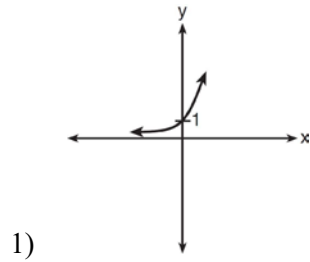 2) $g(x) = \log_3 x + 5$ 4) $g(x) = \log_3 x - 5$

6 The graph of $y = \log_2 x$ is translated to the right 1 unit and down 1 unit. The coordinates of the x-intercept of the translated graph are
  1) $(0,0)$ 3) $(2,0)$
  2) $(1,0)$ 4) $(3,0)$

7 Which equation best represents the graph below?
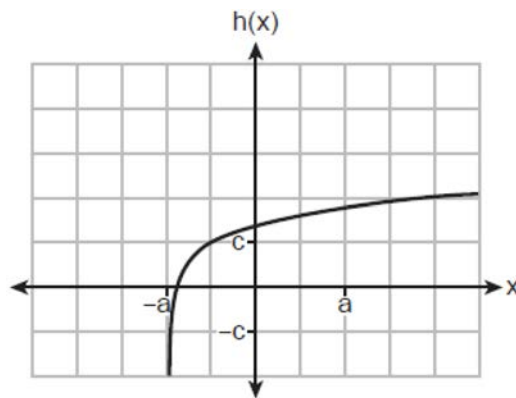
  1) $h(x) = \log(x + a) + c$ 3) $h(x) = \log(x + a) - c$
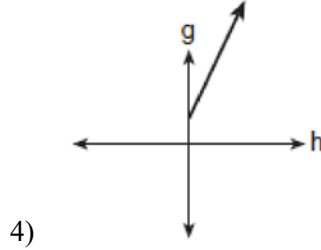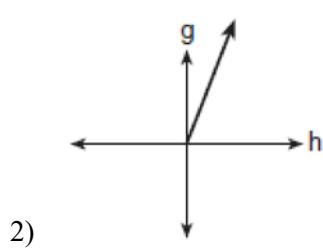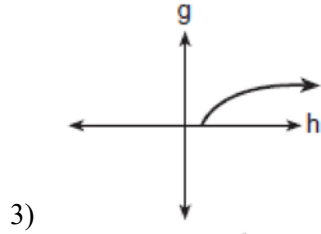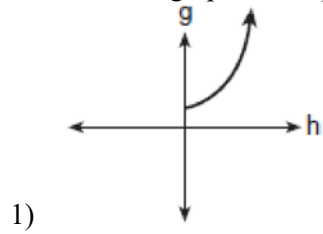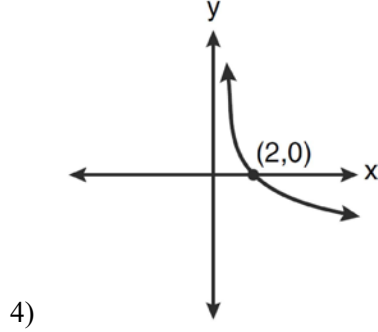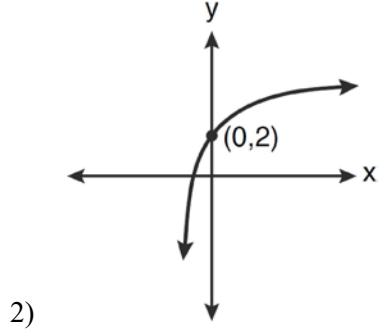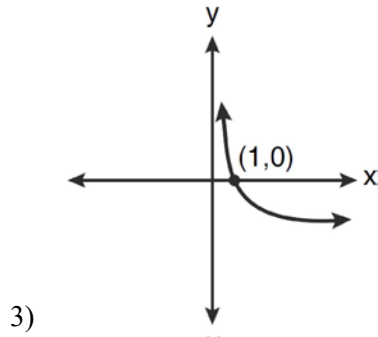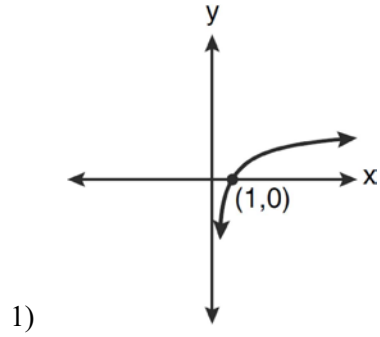 2) $h(x) = \log(x - a) + c$ 4) $h(x) = \log(x - a) - c$

8   Which sketch shows the inverse of $y = a^x$, where $a > 1$?
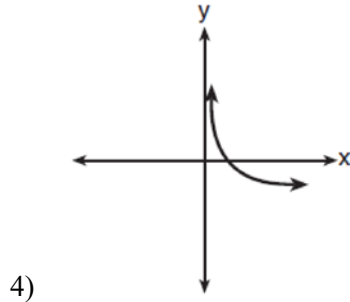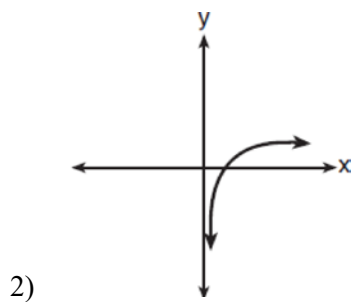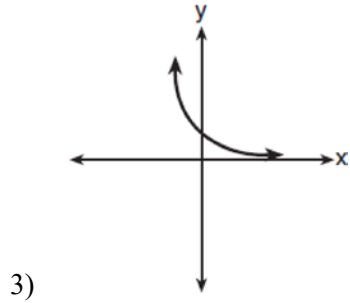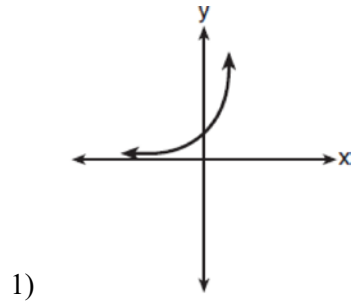
1)

3)

2)

4)

9   The cells of a particular organism increase logarithmically. If g represents cell growth and h represents time, in hours, which graph best represents the growth pattern of the cells of this organism?
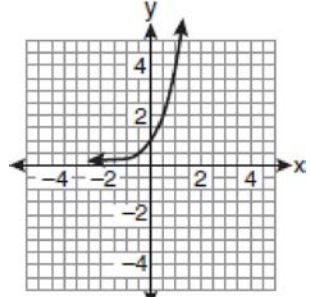
1)

3)

2)

4)

10   Which graph represents the function $\log_2 x = y$?
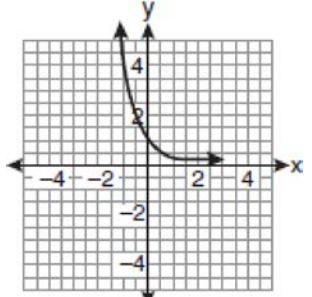

1)

3)

2)

4)

11   Which sketch best represents the graph of $x = 3^y$?
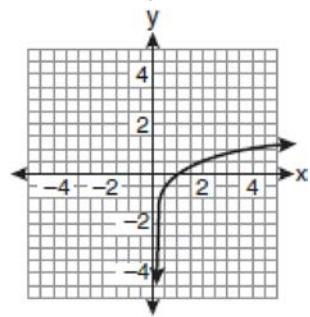

1)

3)

2)

4)

12 If a function is defined by the equation $f(x) = 4^x$, which graph represents the inverse of this function?
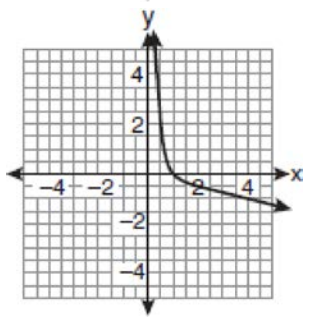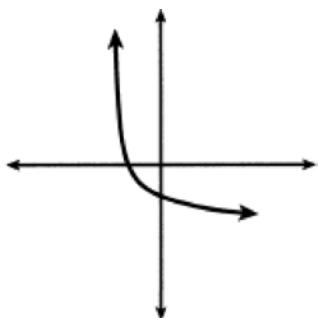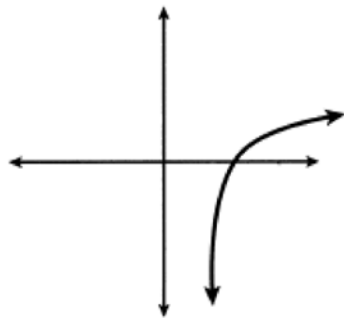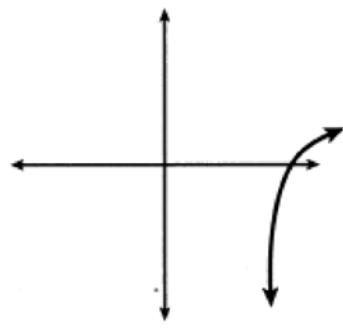
1)

3)

2)

4)

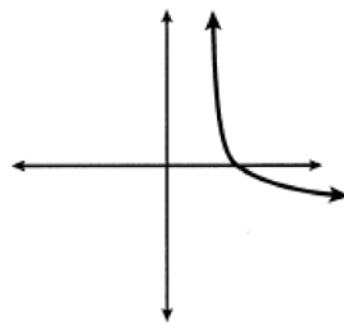13 Which sketch could represent the function $m(x) = -\log_{100}(x - 2)$?
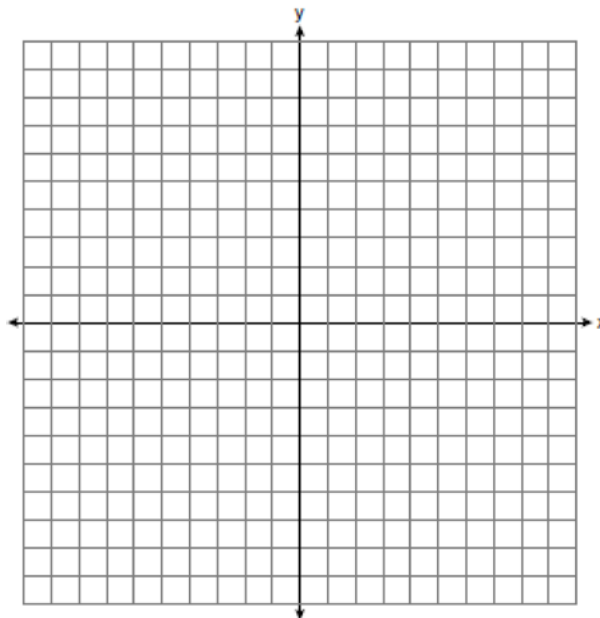
1)

3)

2)

4)

4

14   Sketch and label the graph of $y = 2^x$.

The graph of $y = 2^x$ is subject to each of these transformations:
(1) reflection in the y-axis
(2) reflection in the line $y = x$
(3) translation: $(x,y) \rightarrow (x, y + 1)$
Next to the appropriate numeral below, write the letter of the equation, chosen from the list below, that best described the image of $y = 2^x$ under each of the numbered transformations.
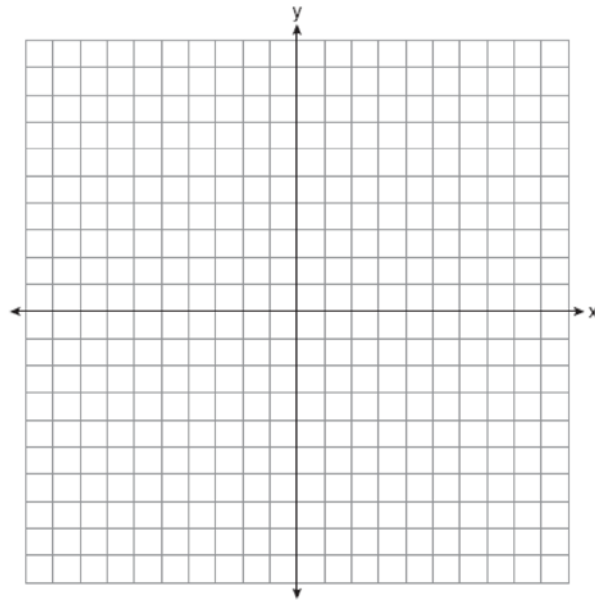*Equations*
(a) $y = \log_2 x$
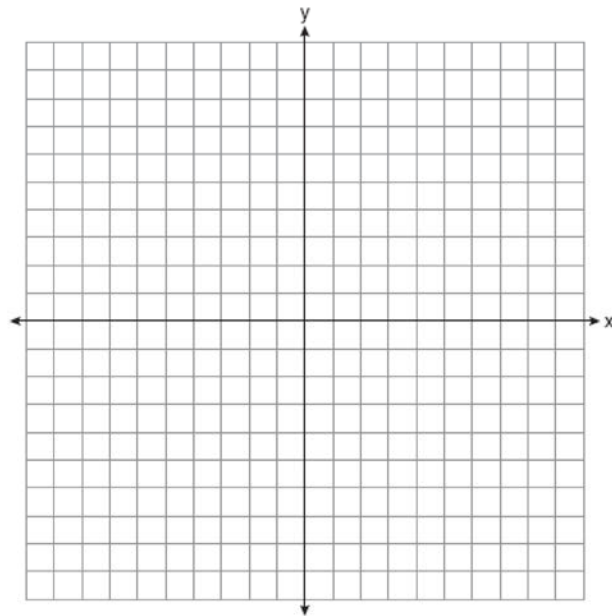
(b) $y = -2^x$

(c) $y = 2^{-x}$

(d) $y = 2^x + 1$

(1)
(2)
(3)

15 Sketch the graph of the functions $f(x) = 3^x$ and $g(x) = \log_3 x$. Considering the graphs, describe the relationship between $f(x)$ and $g(x)$. Specify the domain and the range of g.
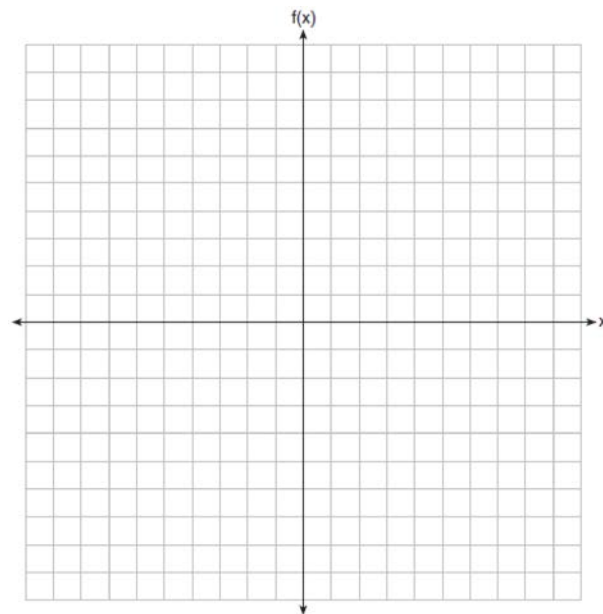

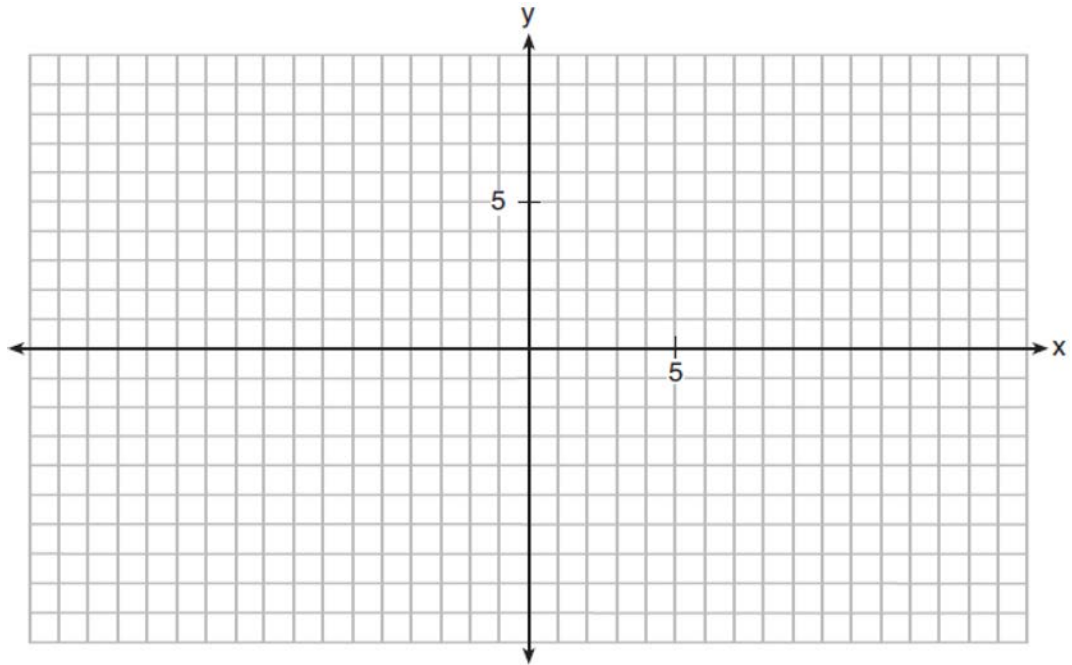16 Sketch below the graph of $y = 4^x$. On the same set of axes, sketch the graph of $y = \log_4 x$.

17 Sketch and label the graph of the equation $y = \log x$ for all values of x in the interval $0.1 \le x \le 10$. On the same set of axes, reflect the graph drawn in the line $y = x$, and label it c. What is the equation of c?
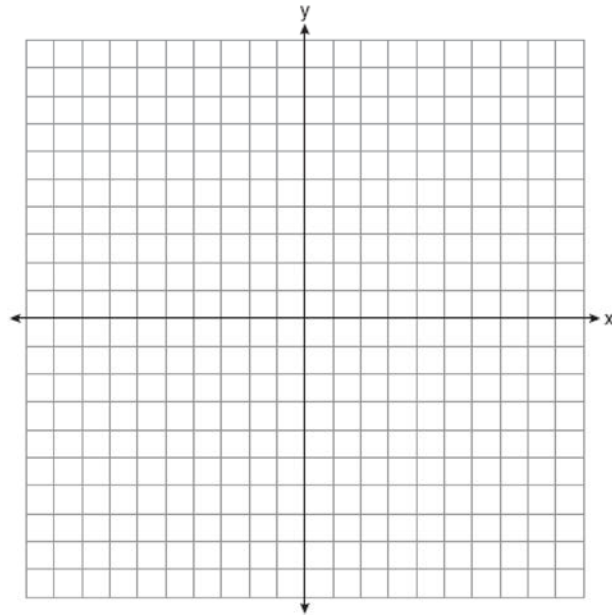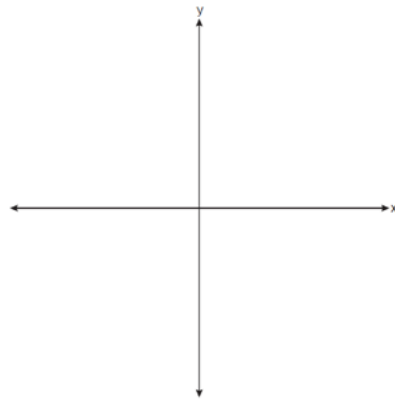
18 Graph $f(x) = \log_2(x + 6)$ on the set of axes below.

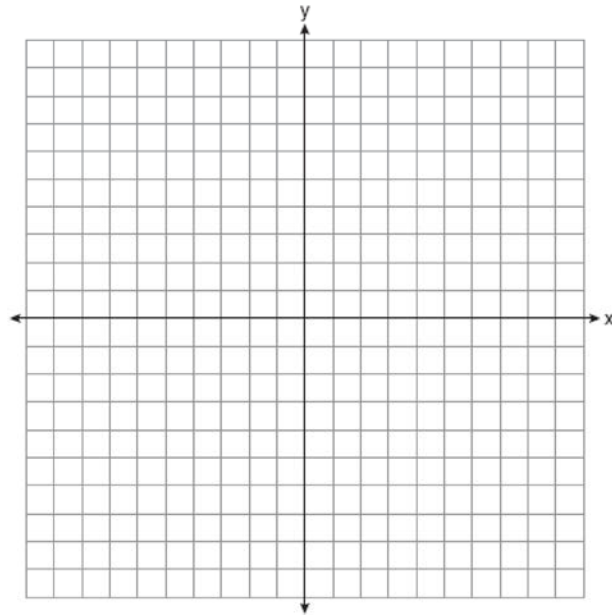19   On the grid below, graph the function $y = \log_2(x - 3) + 1$

20   Sketch $p(x) = -\log_2(x + 3) + 2$ on the axes below.

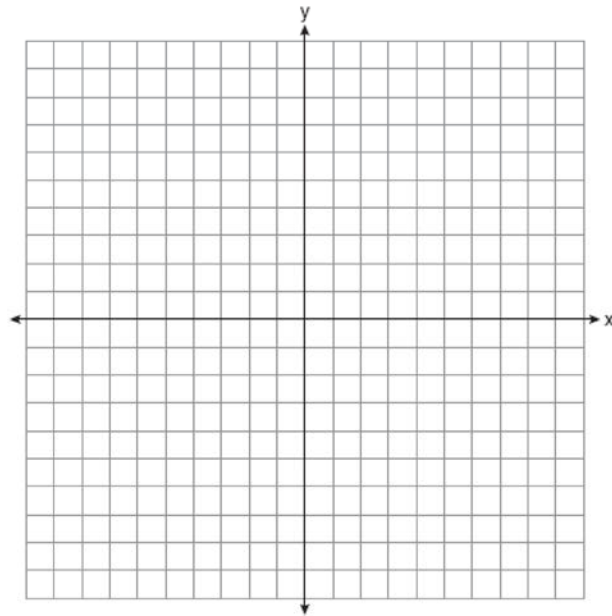Describe the end behavior of $p(x)$ as $x \to -3$. Describe the end behavior of $p(x)$ as $x \to \infty$

21 Graph $y = \log_2(x+3) - 5$ on the set of axes below. Use an appropriate scale to include *both* intercepts.

Describe the behavior of the given function as x approaches -3 and as x approaches positive infinity.

22   Graph the following function on the axes below.
$$f(x) = \log_3(2-x)$$

State the domain of f. State the equation of the asymptote.

23 A hotel finds that its total annual revenue and the number of rooms occupied daily by guests can best be modeled by the function $R = 3\log(n^2 + 10n)$, $n > 0$, where R is the total annual revenue, in millions of dollars, and n is the number of rooms occupied daily by guests. The hotel needs an annual revenue of \$12 million to be profitable. Graph the function on the accompanying grid over the interval $0 < n \le 100$. Calculate the minimum number of rooms that must be occupied daily to be profitable.
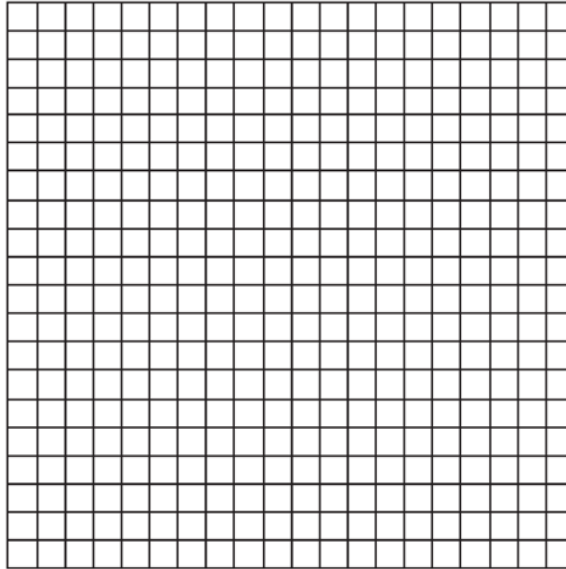
F.IF.C.7: Graphing Logarithmic Functions
Answer Section

1 ANS: 1   REF: 060301b
2 ANS: 4   REF: 018535siii
3 ANS: 1
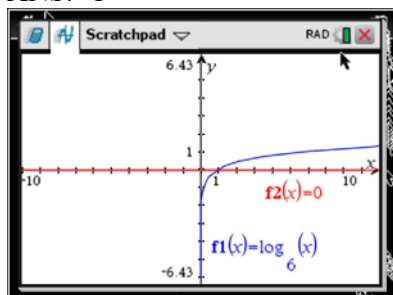
REF: 061618aii
4 ANS: 4   REF: 062215aii
5 ANS: 1   REF: 011902aii
6 ANS: 4

$$\log_2(x-1) - 1 = 0$$

$$\log_2(x-1) = 1$$

$$x - 1 = 2^1$$

$$x = 3$$

REF: 061819aii
7 ANS: 1   REF: 062308aii
8 ANS: 3   REF: 011422a2
9 ANS: 3   REF: 010420b
10 ANS: 1   REF: 061211a2
11 ANS: 2   REF: 081816aii
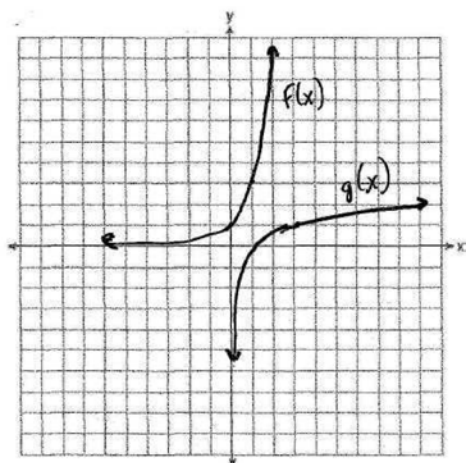12 ANS: 2

$$f^{-1}(x) = \log_4 x$$

REF: fall0916a2
13 ANS: 4

Translate the parent log function 2 to the right and reflect over the *x*-axis.
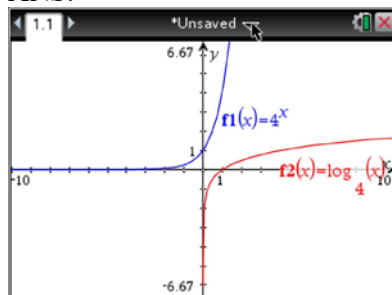
REF: 082207aii
14 ANS:

c, a, d

REF: 088539siii

15 ANS:

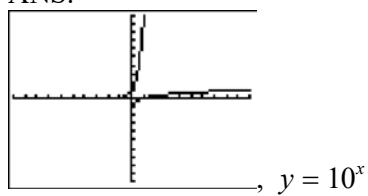f(x) and g(x) are inverses of each other. The domain of g is the positive reals and the range of g is the reals.

REF: fall9927b

16 ANS:
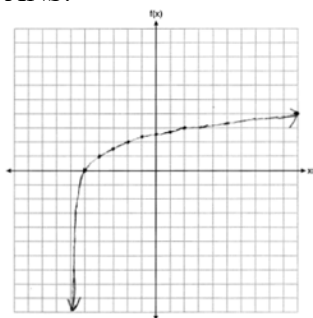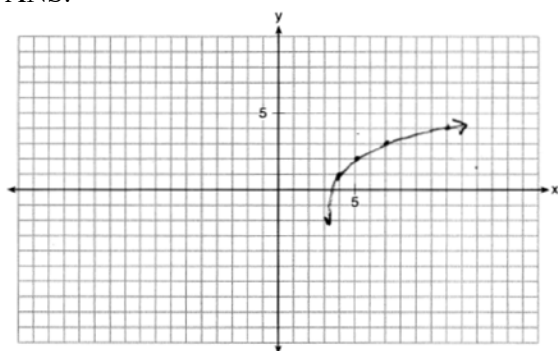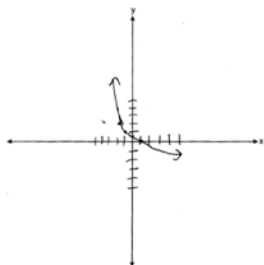

REF: 069039siii

17 ANS:

, $y = 10^x$

REF: 019442siii

18 ANS:

REF: 061927aii

19 ANS:

REF: 011932aii

20 ANS:

As $x \to -3, y \to \infty$. As $x \to \infty, y \to -\infty$..

REF: 082333aii
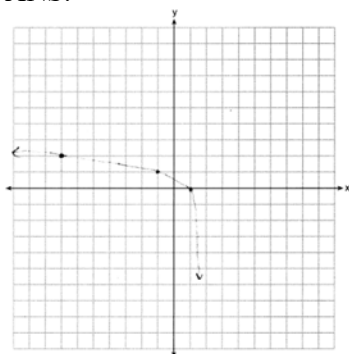
21 ANS:
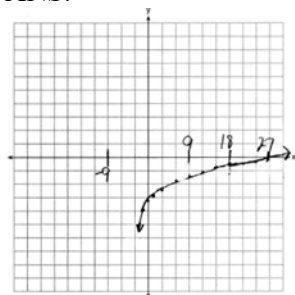
As $x \to -3, y \to -\infty$. As $x \to \infty, y \to \infty$.

REF: 061735aii

22 ANS:

Domain: $x < 2$, Asymptote $x = 2$

REF: 012034aii

23 ANS:
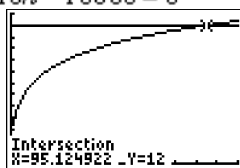

96

$3\log(n^2 + 10n) = 12$

$\log(n^2 + 10n) = 4$

$n^2 + 10n = 10^4$

$n^2 + 10n - 10000 = 0$
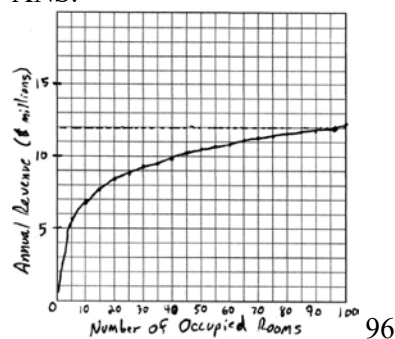
$x = \dfrac{-10 \pm \sqrt{10^2 - 4(-10000)}}{2}$

$x = \dfrac{-10 + \sqrt{40100}}{2} \approx 95.1$

. 96 rooms must be

occupied. The other root is negative.

REF: 080530b