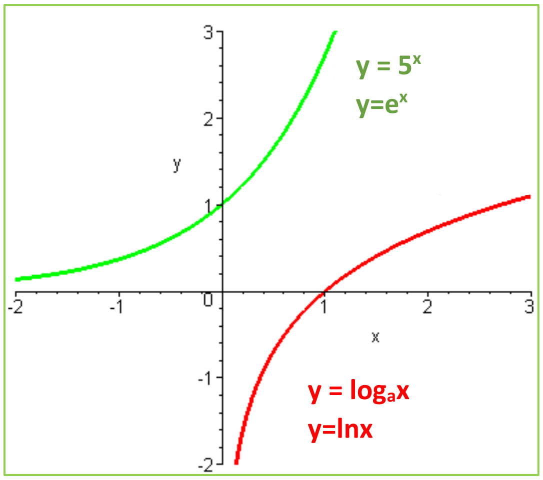


D: $(-\infty,\infty)$ R: $(0, \infty)$

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

*Inverse of each other

$\text{Log}_e x = \ln x$

$\text{Log}_b A = e \leftrightarrow b^e = A$

$\ln A = x \leftrightarrow e^x = A$

b is base, e is exponent, A is answer

1) The domain of the logarithmic function $f(x) = \log_a x$ is $\{x | x > 0\}$ or $(0,\infty)$.

2) The graph of the $f(x) = \log_a x$, $a > 0$, $a \neq 1$, has an x-intercept equal to 1 and no y-intercept.

Choose the correct answer below.

✔ True

3) Determine the domain of $f(x) = \log_2(x + 1)$.

Choose the correct answer below.

○ $(-\infty,\infty)$

✔ $(-1,\infty)$

4) Change the exponential statement to an equivalent statement involving a logarithm.

$8 = 2^3$ $b^e = A$ $b = 2$ $e = 3$ $A = 8$ $\log_b A = e$

The equivalent logarithmic statement is $\log_2 8 = 3$. (Type an equation.)

5) Change the exponential statement to an equivalent statement involving a logarithm.

$4.5 = a^5$

The equivalent logarithmic statement is $\log_a 4.5 = 5$.

6) Change the exponential statement to an equivalent statement involving a logarithm.

$9.7 = 7^x$

Evaluate the expression without using a calculator. $\log_7 9.7 = x$.

$\log_3 1$

$\log_3 1 = 0$

7) Change the exponential statement to an equivalent statement involving a logarithm.

$e^x = 11$ $\log_e 11 = x$ where $\log_e = \ln$

The equivalent logarithmic statement is $\ln 11 = x$. (Type an equation.)

8) Change the logarithmic statement to an equivalent statement involving an exponent.

$\log_9 81 = 2$ $\text{Log}_b A = e$ $b^e = A$

The equivalent exponential statement is $9^2 = 81$. (Type an equation.)

9) Change the logarithmic statement to an equivalent statement involving an exponent.

$\log_a 5 = 6$

The equivalent exponential statement is $a^6 = 5$. (Type an equation.)

10) Change the logarithmic statement to an equivalent statement involving an exponent.

$\log_8 4096 = x$

The equivalent exponential statement is $8^x = 4096$. (Type an equation.)

11) Change the logarithmic statement to an equivalent statement involving an exponent.

$\ln 11 = x$

The equivalent exponential statement is $e^x = 11$. (Type an equation.)

$b^0 = 1$ $x^{-1} = \frac{1}{x}$ $x^{1/2} = \sqrt{x}$

12) Evaluate the expression without using a calculator.

$\log_3 1$ $3^x = 1$ $x = 0$

$\log_3 1 = 0$

13) Find the exact value of the logarithm without using a calculator.

$\log_5 25$ $5^x = 25$ $x = 2$

$\log_5 25 = 2$

14) Find the exact value of the logarithm without using a calculator.

$\log_{1/2} 16$ $\frac{1}{2}^x = 16$ $2^4 = 16$

$\log_{1/2} 16 = -4$ (Type an integer or a simplified fraction.)

*fraction to a whole number is negative exponent

15) Find the exact value of the logarithm without using a calculator.

$\log_8 \sqrt{8} = x$ $8^x = \sqrt{8}$ $x^{1/2} = \sqrt{x}$

Same bases → $8^x = 8^{1/2}$ then $x = ½$

16) Find the exact value of the logarithm without using a calculator.

$\log_{\sqrt{7}} 49$ $\sqrt{7}^x = 49$

$\log_{\sqrt{7}} 49 = 4$ Same bases → $7^{1/2x} = 7^2$ then

$½x = 2$ $x = 4$

17) Find the exact value of the logarithm without using a calculator.

$\ln \sqrt[4]{e}$ **ln*e* cancel each other out and the answer is the exponent

$\ln \sqrt[4]{e} = \frac{1}{4}$ (Type an integer or a simplified fraction.) Square root is a fractional exponent

18) Find the domain of the function. only use horizontal shift, which is in **parenthesis**

h(x) = ln(x − 9) right 9

The domain of h is (9,∞).
(Type your answer in interval notation.)

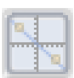
19) Domain of $9 - 2log_3[\frac{x}{6} - 5]$ only use horizontal shift, which is in **brackets**

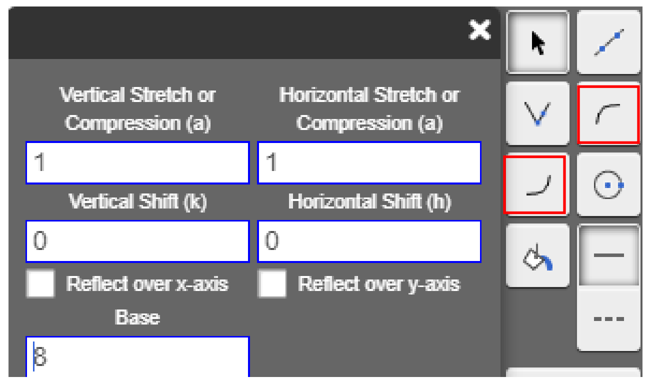
$\frac{x}{6} - 5 > 0 \quad x > 30$ (30,∞)

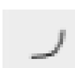
20) Graph the following function and its inverse on the same Cartesian plane.

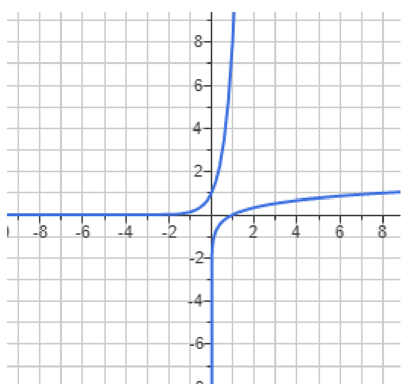
$f(x) = 8^x;\ f^{-1}(x) = \log_8 x$

Use the graphing tool to graph the function.



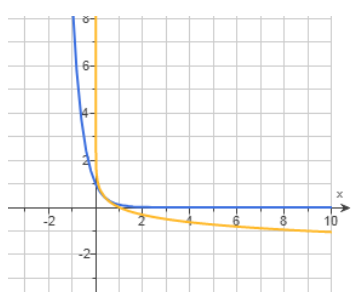


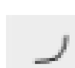
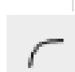
Click  *and change base to 8 then*  *and change base to 8*
MAKE TWO GRAPHS



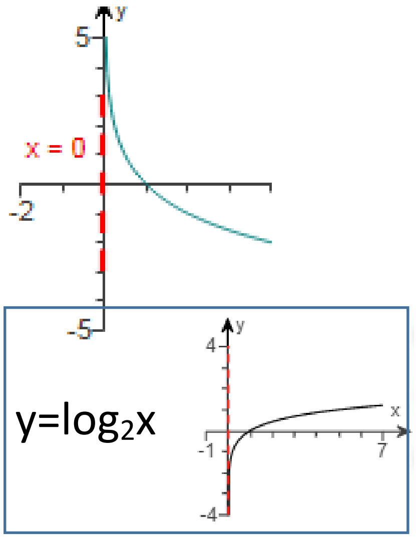
21) f(x) = $(\frac{1}{7})^x$ $f^{-1}(x) = log_{\frac{1}{7}}x$

Inverse is yellow



Choose both shapes   *and make base* $\frac{1}{7}$ *for both graphs*

22) Find the equation:



A. $y = -\log_2(-x)$

B. $y = \log_2(-x)$

C. $y = \log_2 x - 1$

D. $y = -\log_2 x$

E. $y = \log_2 x$

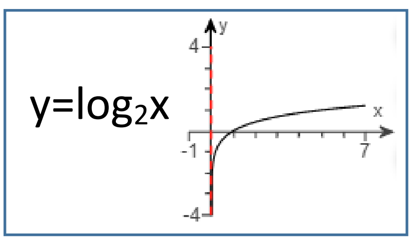
F. $y = 1 - \log_2 x$

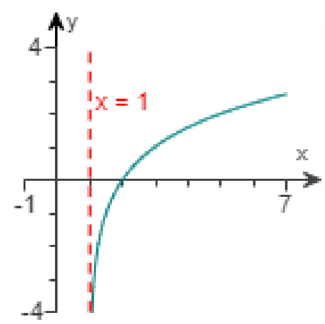
G. $y = \log_2(1 - x)$

H. $y = \log_2(x - 1)$

Flips across the x axis

23) The graph of a logarithmic function is given. Match the graph to its function.





Shifts right 1

Which function matches the graph?

A. $y = -\log_2 x$

B. $y = 1 - \log_2 x$

C. $y = -\log_2(-x)$

D. $y = \log_2 x$

E. $y = \log_2(-x)$

F. $y = \log_2(x - 1)$

EXAMPLE: ln(x+4)-3 inverse: $e^{x+3} - 4$

EXAMPLE: $\log_7(x-2) + 5$ inverse: $7^{x-5} + 2$

Horizontal and vertical shifts switch and change the sign

**Domain and Range switch.*

24) Use the given function f to answer parts **(a)** th

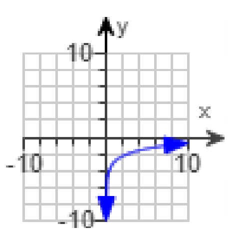
$f(x) = \ln(x-3)$ ← Right 3 converts to up 3

(a) Find the domain of f.

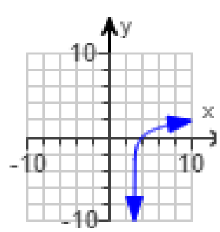
The domain of f is $(3,\infty)$.
(Type your answer in interval notation.)

(b) Graph f. Choose the correct graph below.

Right 3



B.



(c) From the graph, determine the range and an

The range of f is $(-\infty,\infty)$.
(Type your answer in interval notation.)

Determine the vertical asymptote of f. Select the answer box to complete your choice.

A. The vertical asymptote of f is x = 3.

(d) Find f^{-1}, the inverse of f.

$f^{-1}(x) = e^{x} + 3$ (Simplify your answer.)

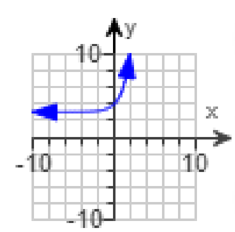
(e) Find the domain and range of f^{-1}.

The domain of f^{-1} is $(-\infty,\infty)$.
(Type your answer in interval notation.)

The range of f^{-1} is $(3,\infty)$.
(Type your answer in interval notation.)
Up 3

(f) Graph f^{-1}. Choos

A.



25) Use the given function f to an

f(x) = − 5 + ln x

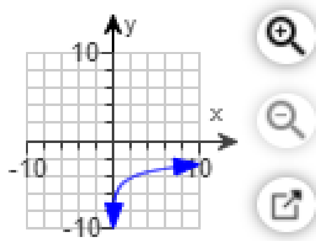
(a) Find the domain of f.

The domain of f is (0,∞).

(Type your answer in interval

(b) Graph f. Choose the corre

A. Down 5



(c) From the graph, determine the range and

The range of f is (− ∞,∞).

(Type your answer in interval notation.)

Determine the vertical asymptote of f. Select answer box to complete your choice.

A. The vertical asymptote of f is x = 0. (

down 5 converts to right 5

(d) Find f^{-1}, the inverse of f.

$f^{-1}(x) = e^{x+5}$ (Simplify your answer.)

(e) Find the domain and range of f^{-1}.

The domain of f^{-1} is (− ∞,∞).

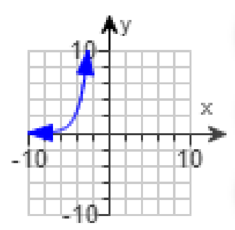
(Type your answer in interval notation.)

The range of f^{-1} is (0,∞).

(Type your answer in interval notation.)

(f) Graph f^{-1}. Choose the correct graph below.

Left 5



26) f(x) = $-2 + log_3(x+4)$

Domain (-4,∞) Range (-∞,∞)

left 4 down 2 *switch position and sign*

SHORTCUT: right 2 down 4

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

Find f $^{-1}$(x) algebraic way:

$x = -2 + log_3(y+4)$

$x + 2 = log_3(y+4)$

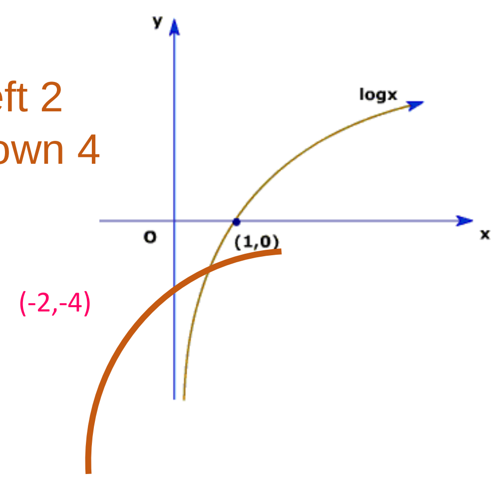
$3^{x+2} = y + 4$

$3^{x+2} - 4 = f^{-1}(x)$ Domain (-∞,∞)

Range (-4,∞)

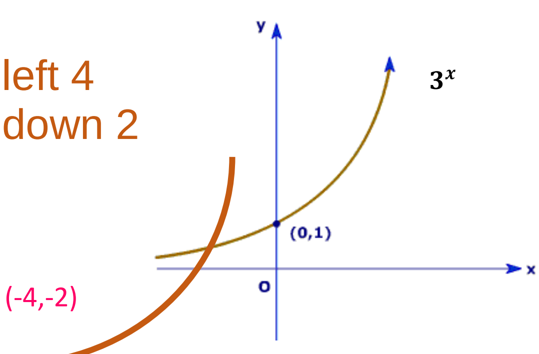
left 2

down 4



left 4

down 2



coordinates switch

$$\log_b b^x = x \qquad b^{\log_b x} = x$$

27) Solve: $log_6 x = 3$

Another way: $6^{log_6 x} = 6^3$

change to exponential form: $6^3 = x$

$x = 216$

28) f(x) = $log_3(9x-2) = 4$

Another way: $3^{log_3(9x-2)} = 3^4$

change to exponential form: $3^4 = 9x - 2$

$9x-2 = 81$ $\quad x = \frac{83}{9}$

29) Solve the equation.

$\log_x 64 = 2$

The solution set is {8}.

$x^2 = 64$

30) Solve the equation.

$\log_6 216 = x$

The solution set is {3}.

$6^x = 216$

31) f(x) = $log_5 125 = 3x + 1$

$5^3 = 125$

$3 = 3x + 1$ $\quad 2 = 3x$ $\quad x = \frac{2}{3}$

32) f(x) = $e^{2x} = 3$ take ln of both sides ***lne* = 1**

$\ln e^{2x} = \ln 3$

$2x = ln3$ $\quad x = \frac{ln3}{2}$

33) f(x) = $e^{8x-3} = 2$ take ln of both sides ***lne* = 1**

$\ln e^{8x-3} = \ln 2$

$8x - 3 = ln2$

$8x = \ln 2 + 3$ $x = \frac{ln2+3}{8}$

34) f(x) = $log_4(x^2 - 6) = 3$ change to exponential form

$x^2 - 6 = 4^3$ $x^2 = 70$ x = - $\sqrt{70}$, $\sqrt{70}$

35) f(x) = $log_9 729^x = -3$ change to exponential form

$729^x = 9^{-3}$

$9^{3x} = 9^{-3}$ x = - 1

36) f(x) = $5 \cdot 10^{4-x} = 12$ divide by 5 first

$10^{4-x} = \frac{12}{5}$ take $\log_{10}$ on both sides

$\log_{10} 10^{4-x} = \log_{10}(\frac{12}{5})$

$4 - x = \log_{10}(\frac{12}{5})$ move 4 to the right

$-x = \log_{10}\left(\frac{12}{5}\right) - 4$ divide by -1

$x = -\log_{10}\left(\frac{12}{5}\right) + 4$

37) Suppose that G(x) =$log_2(2x + 2) - 3$ 2x+2 = 0 2x = -2

(a) What is the domain of G? (-1,∞)

(b) What is G(1)? What point is on the graph? Plug in 1 for x

$log_2(2(1) + 2) - 3$

$log_2(4) - 3$

$2^2 = 4$

2 - 3 = -1 where point is (1,-1)

(c) If G(x) =2, what is x? What is the point?

$log_2(2x + 2) - 3$ set equal to 2

$log_2(2x + 2) - 3 = 2$ move -5 to the right

$log_2(2x + 2) = 5$ $4^0 = 1$

$2x+2=2^5$ 2x=30 x =15 where point is (15,2)

(d) Give the zero of G(x) *set it equal to zero*

$$log_2(2x+2)-3=0$$

$$\log_2(2x+2)=3$$

$2x+2=2^3$ $2x=6$ $x = 3$

38) The pH of a chemical solution is given by the formula

$pH = -\log_{10}[H^+]$ where $[H^+]$ is the concentration of hydrogen ions in moles per liter. Values of pH range from 0 (acidic) to 14 (alkaline)

a) What is the pH of a solution for which $[H^+]$ is 0.1? 1

b) What is the pH of a solution for which $[H^+]$ is 0.01? 2

c) What is the pH of a solution for which $[H^+]$ is 0.001? 3

d) What happens to the pH as hydrogen decreases? pH increases

e) Determine the hydrogen ion concentration of a solution with pH = 3.9

$$3.9 = -\log_{10}[H^+]$$

$$-3.9 = \log_{10}[H^+]$$

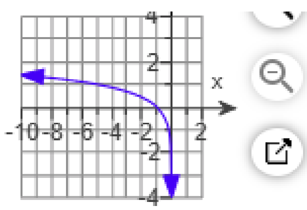
$10^{-3.9} = [H^+]$ .000126

e) Determine the hydrogen ion concentration of a solution with pH = 7.8

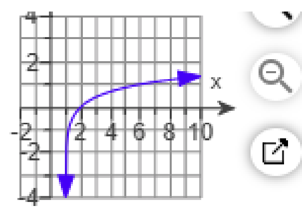
$$7.8 = -\log_{10}[H^+]$$

$$-7.8 = \log_{10}[H^+]$$

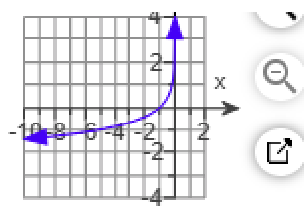
$10^{-7.8} = [H^+]$ 1.6×10^{-8}



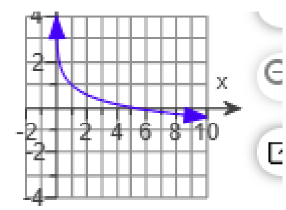
$y = \log_5(-x)$



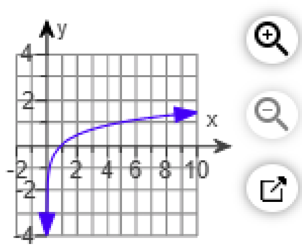
$y = \log_5(x-1)$



$y = -\log_5(-x)$

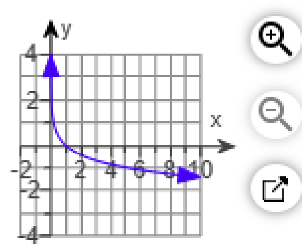


$y = 1 - \log_5 x$



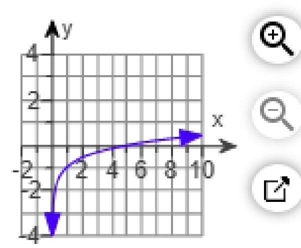
$y = \log_5 x$

70.



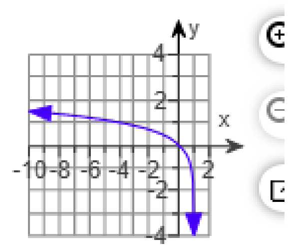
$y = -\log_5 x$

71.



$y = \log_5 x - 1$

72.



$y = \log_5(1-x)$