

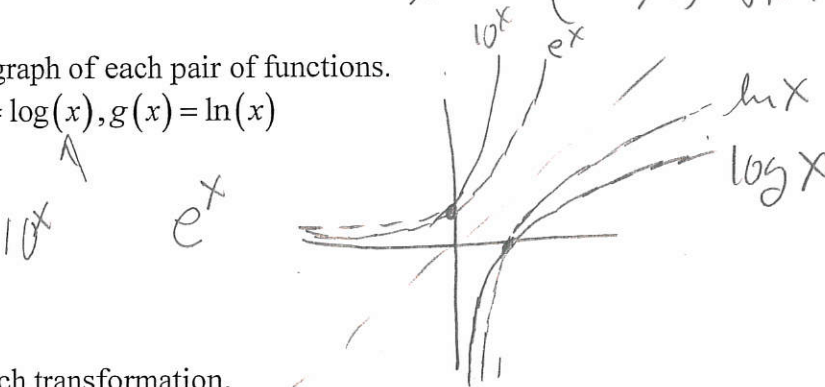
### Section 4.5 Exercises

For each function, find the domain and the vertical asymptote.

1.  $f(x) = \log(x-5)$  D:  $x > 5$  VA:  $x = 5$
3.  $f(x) = \ln(3-x)$   $3-x > 0 \Rightarrow x < 3$  D:  $(-\infty, 3)$  VA:  $x = 3$
5.  $f(x) = \log(3x+1)$   $3x+1 > 0 \Rightarrow x > -\frac{1}{3}$  VA:  $x = -\frac{1}{3}$
7.  $f(x) = 3\log(-x)+2$   $-x > 0 \Rightarrow x < 0$  D:  $(-\infty, 0)$  VA:  $x = 0$

Sketch a graph of each pair of functions.

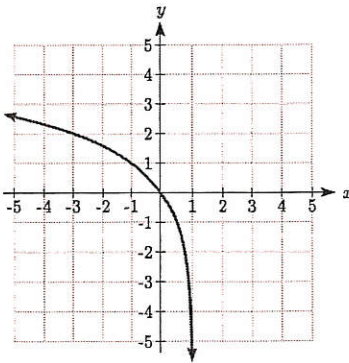
9.  $f(x) = \log(x), g(x) = \ln(x)$



Sketch each transformation.

11.  $f(x) = 2\log(x)$
12.  $f(x) = 3\ln(x)$
13.  $f(x) = \ln(-x)$
14.  $f(x) = -\log(x)$
15.  $f(x) = \log_2(x+2)$
16.  $f(x) = \log_3(x+4)$

Find a formula for the transformed logarithm graph shown.

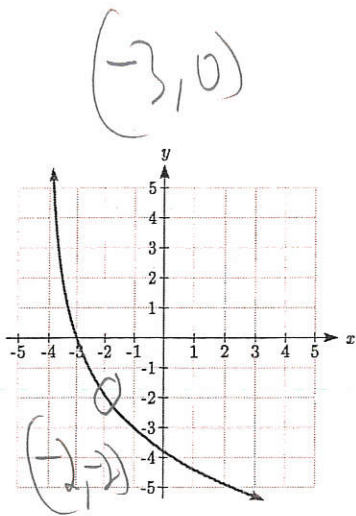


17.

$(0, 0)$   
 $(-1, -1)$   
 $y = a \log_2(-(x-1)) + k$   
 $0 = a \log_2 1 + k$   
 $0 = 0 + k$   
 $-1 = a \log_2 2$

$\frac{-1}{\log_2 2} = a$   
 $y = \frac{-1}{\log_2 2} \log_2(-(x-1))$

Se graph paper if you desire  
 (next page)



19.

Find a formula for the transformed logarithm graph shown.

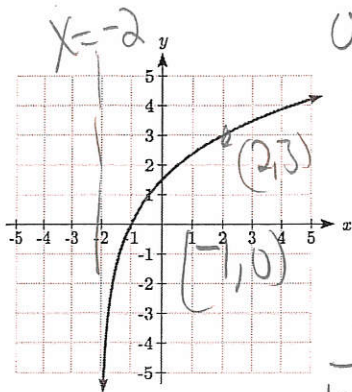
$$y = a \log(x+4) + k$$

$$0 = a \log 1 + k \quad -2 = a \log 2$$

$$0 = k$$

$$\frac{-2}{\log 2} = a$$

$$y = -\frac{2}{\log 2} \log(x+4)$$



21.

$$0 = a \log(-1+2) + k$$

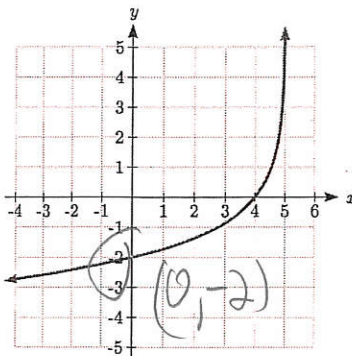
$$0 = a \log 1 + k$$

$$0 = k$$

$$3 = a \log_2(4)$$

$$\frac{3}{\log 4} = a \quad \text{or} \quad \frac{3}{\log 2^2}$$

$$y = \frac{3}{2 \log 2} \log(x+2)$$



23.

VA =  $x = 5$

$$y = a \log(-(x-5)) + k$$

$$0 = a \log(+1) + k$$

$$0 = k$$

$$y = a \log(-(x-5))$$

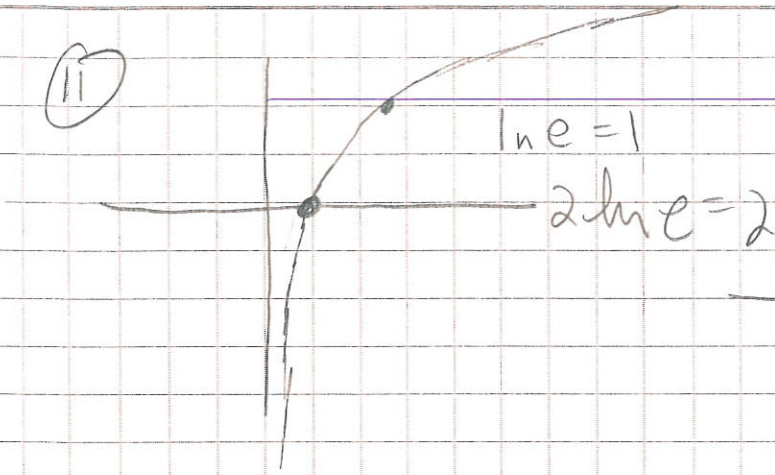
$$-2 = a \log 5$$

$$\frac{-2}{\log 5} = a$$

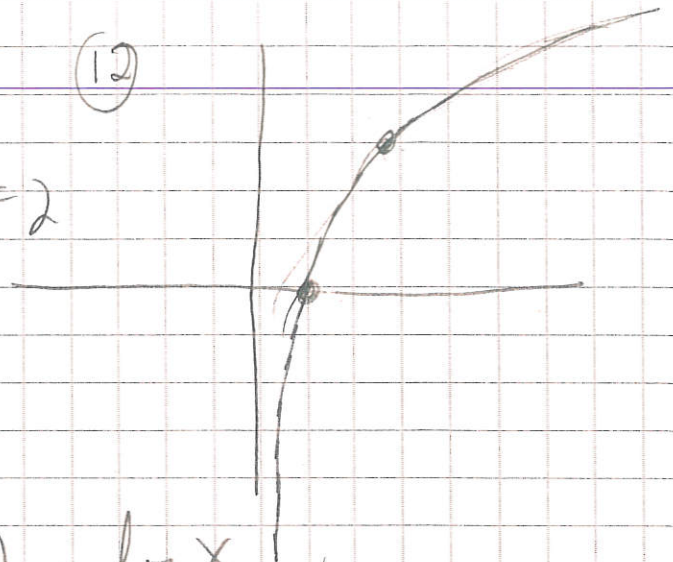
$$y = -\frac{2}{\log 5} \log(-(x-5))$$

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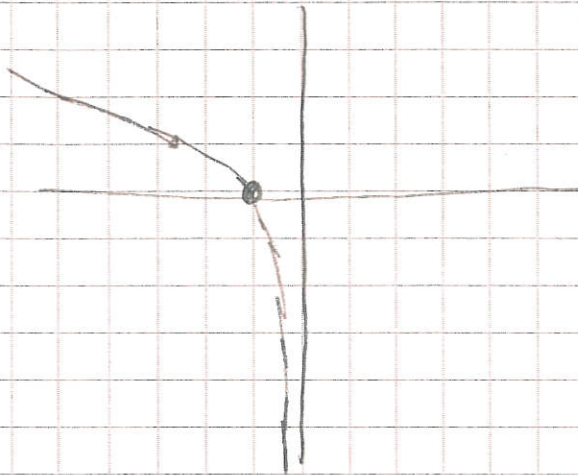
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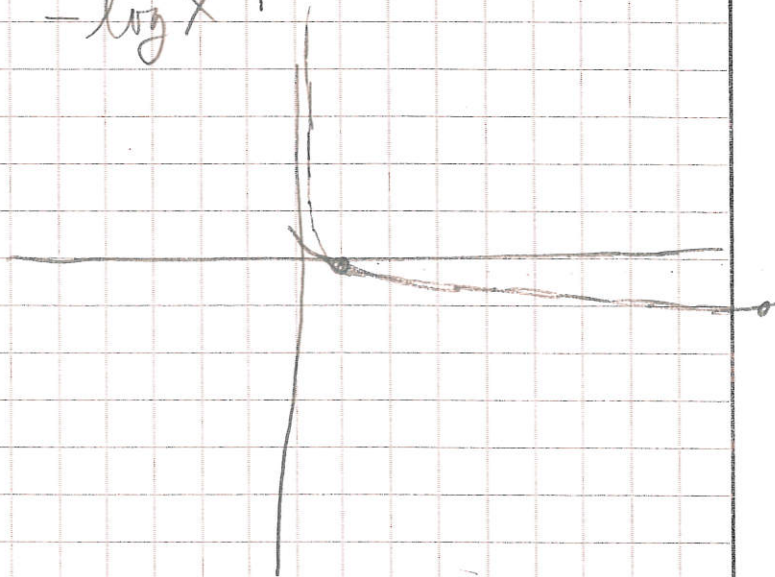
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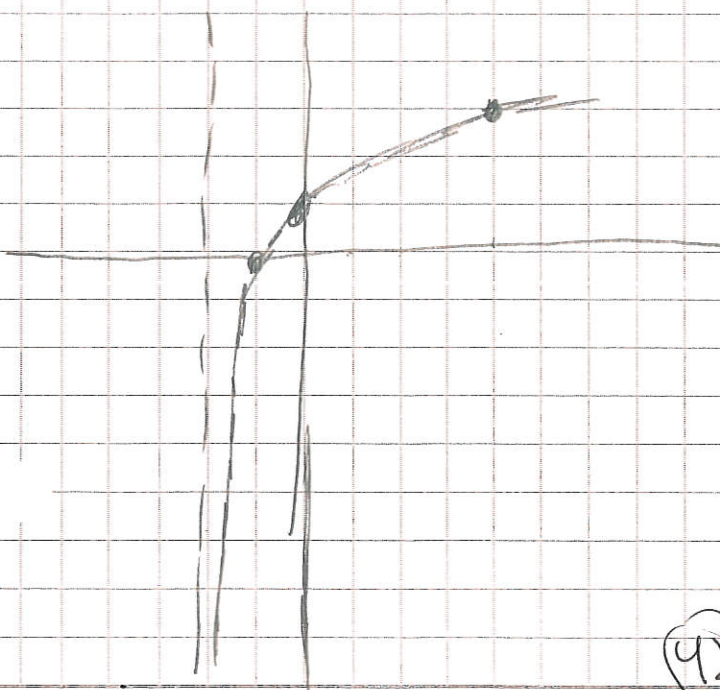
(13)  $\ln(-x)$



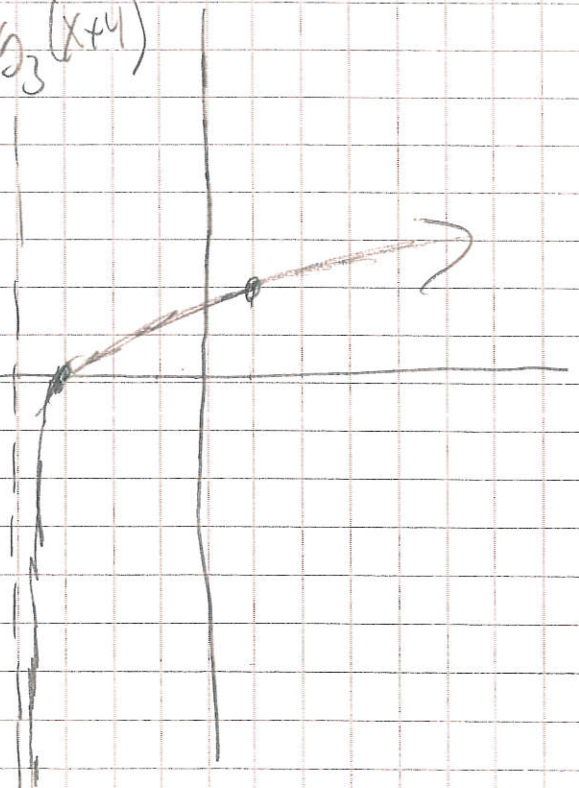
(14)  $-\log x$



(15)  $\log_2(x+2)$



(16)  $\log_3(x+4)$



(17)



## Learning Target!

Example: A radioactive substance decays following the equation  $f(t) = 100e^{-0.036t}$ . Find the half-life.

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Example: The half-life of Iodine-131 is 8 days. Find the annual decay rate. How much will remain in 100 days?