7.5 Graph Logarithmic Functions

TEKS *a.5, a.6, 2A.11.B*

QUESTION How can you graph logarithmic functions on a graphing calculator?

You can use a graphing calculator to graph logarithmic functions simply by using the LOG or LN key. To graph a logarithmic function having a base other than 10 or e, you need to use the change-of-base formula to rewrite the function in terms of common or natural logarithms.
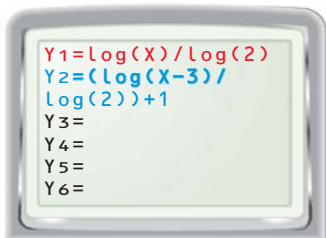
EXAMPLE Graph logarithmic functions

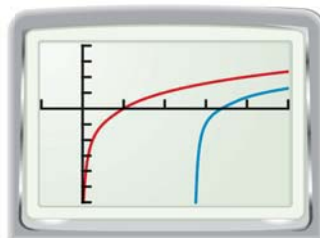Use a graphing calculator to graph $y = \log_2 x$ and $y = \log_2 (x - 3) + 1$.

STEP 1 *Rewrite functions* Use the change-of-base formula to rewrite each function in terms of common logarithms.

$$y = \log_2 x \qquad y = \log_2 (x - 3) + 1$$

$$= \frac{\log x}{\log 2} \qquad = \frac{\log (x - 3)}{\log 2} + 1$$

STEP 2 *Enter functions*
Enter each function into a graphing calculator.

STEP 3 *Graph functions*
Graph the functions.


```
Y1=log(X)/log(2)
Y2=(log(X-3)/
log(2))+1
Y3=
Y4=
Y5=
Y6=
```


PRACTICE

Use a graphing calculator to graph the function.

1. $y = \log_4 x$

2. $y = \log_8 x$

3. $f(x) = \log_3 x$

4. $y = \log_5 x$

5. $y = \log_{12} x$

6. $g(x) = \log_9 x$

7. $y = \log_3 (x + 2)$

8. $y = \log_5 x - 1$

9. $f(x) = \log_4 (x - 5) - 2$

10. $y = \log_2 (x + 4) - 7$

11. $y = \log_7 (x - 5) + 3$

12. $g(x) = \log_3 (x + 6) - 6$

13. REASONING Graph $y = \ln x$. If your calculator did not have a natural logarithm key, explain how you could graph $y = \ln x$ using the LOG key.