

4.4 Graphs of Logarithmic Functions

- Since the functions are inverses, their graphs are mirror images about the line $y = x$. So for every point (a, b) on the graph of a logarithmic function, there is a corresponding point (b, a) on the graph of its inverse exponential function.
- Shifting the function right or left and reflecting the function about the y-axis will affect its domain.
- No. A horizontal asymptote would suggest a limit on the range, and the range of any logarithmic function in general form is all real numbers.

7. Domain is $\left(-\infty, \frac{1}{2}\right)$; Range is $(-\infty, \infty)$

9. Domain is $\left(-\frac{17}{4}, \infty\right)$; Range is $(-\infty, \infty)$

11. Domain is $(5, \infty)$; The vertical asymptote will be at $x = 5$.

13. Domain is $\left(-\frac{1}{3}, \infty\right)$; The vertical asymptote will be at $x = -\frac{1}{3}$.

15. Domain is $(-3, \infty)$; The vertical asymptote will be at $x = -3$.

17. Domain is $\left(\frac{3}{7}, \infty\right)$; The vertical asymptote will be at $x = \frac{3}{7}$. $x \rightarrow \left(\frac{3}{7}\right)^+, f(x) \rightarrow -\infty$ $x \rightarrow \infty, f(x) \rightarrow \infty$

19. Domain is $(-3, \infty)$; The vertical asymptote will be at $x = -3$. $x \rightarrow -3^+, f(x) \rightarrow -\infty$ and as x approaches $+\infty$, determine what y-value, $f(x)$, approaches. As $x \rightarrow \infty, f(x) \rightarrow \infty$

21. Domain is $(1, \infty)$; Range is $(-\infty, \infty)$. vertical asymptote will be at $x = 1$. the x-intercept is $\left(\frac{5}{4}, 0\right)$; the y-intercept DNE

23. Domain is $(-\infty, 0)$; Range is $(-\infty, \infty)$. the vertical asymptote is at $x = 0$. x-intercept is $(-e^2, 0)$; y-intercept DNE

25. Domain is $(0, \infty)$; Range is $(-\infty, \infty)$. vertical asymptote remains at $x = 0$. x-intercept is $(e^3, 0)$; y-intercept DNE

27. B

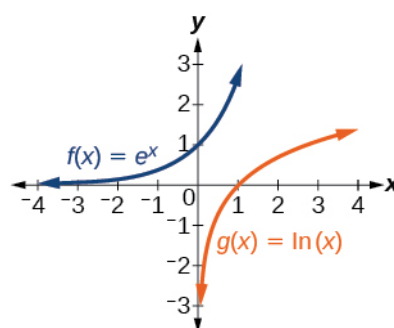
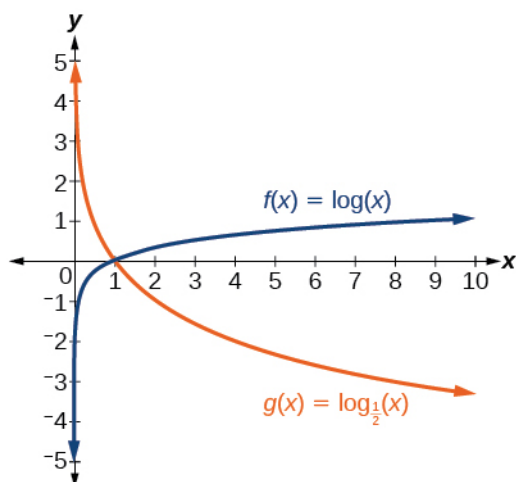
37.

29. C

31. B

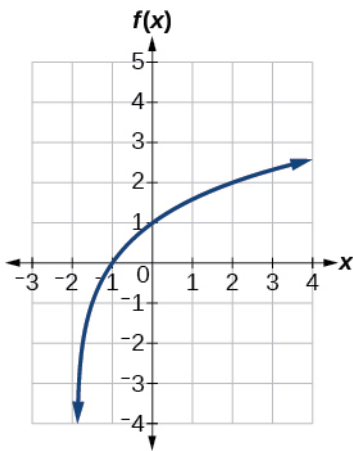
33. C

35.

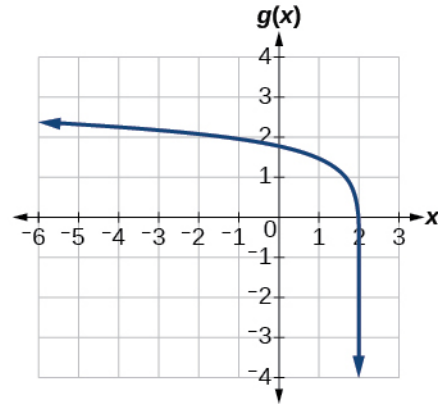


39. C

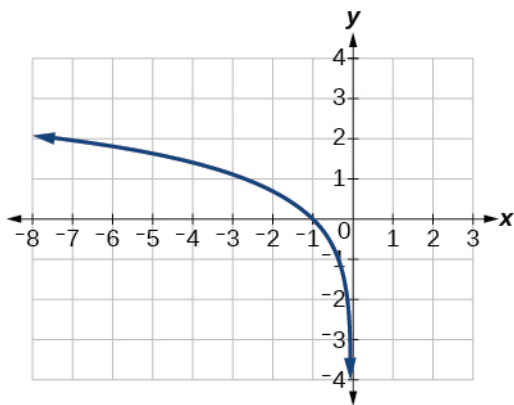
41.



45. the x-intercept is $(1.96, 0)$; the y-intercept is $(0, 1.8)$



43.



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

49. $y = 3\log_4(x+2)$

51. $x = 2$

53. $x \approx 2.303$

55. $x \approx -0.472$

57. Conjecture: for any positive base $b \neq 1$,
 $\log_b(x) = -\log_{\frac{1}{b}}(x)$.

59. the domain is $(-\infty, -2) \cup (4, \infty)$.