

7.3 #s 2, 4, 7, 10, 18, 22, 23, 26, 28, 22, 36, 50, 54, 60, 62, 65

3-8 Find the exact value of each expression.

See website
✓ Chapter 7
homework
assignments.

3. (a) $\log_5 125 =$
 $\log_5 (5^3) = 3$

(b) $\log_3 \frac{1}{27}$
 $= \log_3 \left(\frac{1}{3^3} \right)$

$3 \log_5 (5^{-1}) = 3 \cdot -1$ $= \log_3 (3^{-3}) = -3$

7. (a) $\log_2 6 - \log_2 15 + \log_2 20 = \log_2 \left(\frac{6 \cdot 20}{15} \right) = \log_2 (8) = 3$

(b) $\log_3 100 - \log_3 18 - \log_3 50$
 $= \log_3 \left(\frac{100}{18 \cdot 50} \right) = \log_3 \left(\frac{2}{9} \right) = \log_3 \left(\frac{1}{3^2} \right) = -2$

$(ab)^c = a^c b^c$

$\left(\frac{a^b}{a^c} \right) = a^{b-c}$

$(a^b)^c = a^{bc}$

$\frac{a^b}{a^c} = a^{b-c}$

$\log(ab) = \log a + \log b$

$\log(a^b) = b \log a$

$\log\left(\frac{a}{b}\right) = \log a - \log b$

etc.

9-12 Use the properties of logarithms to expand the quantity.

9. $\log_2 \left(\frac{x^3 y}{z^2} \right)$

- (b) What is the domain of this function?
- (c) What is the range of this function?
- (d) Sketch the general shape of the graph of the function $y = \log_a x$ if $a > 1$.

13-18 Express the quantity as a single logarithm.

13. $\log_{10} a - \log_{10} b + \log_{10} c$

$$= \log\left(\frac{ac}{b}\right)$$

$$3 \log(x) + 17 \log(y) - 5 \log(z)$$

=

$$= \log\left(\frac{x^3 y^{17}}{z^5}\right)$$

4 If $a > 1$, then

$$\lim_{x \rightarrow \infty} \log_a x = \infty \quad \text{and} \quad \lim_{x \rightarrow 0^+} \log_a x = -\infty$$

$$\log_e x = \ln x$$

5

$$\ln x = y \iff e^y = x$$

6

$$\ln(e^x) = x \quad x \in \mathbb{R}$$

$$e^{\ln x} = x \quad x > 0$$

$$\ln e = 1$$

7 CHANGE OF BASE FORMULA For any positive number a ($a \neq 1$), we have

$$\log_a x = \frac{\ln x}{\ln a}$$

8

$$\lim_{x \rightarrow \infty} \ln x = \infty \qquad \lim_{x \rightarrow 0^+} \ln x = -\infty$$

19. Use Formula 7 to evaluate each logarithm correct to six decimal places.

- (a) $\log_{12} e$ (b) $\log_6 13.54$ (c) $\log_2 \pi$

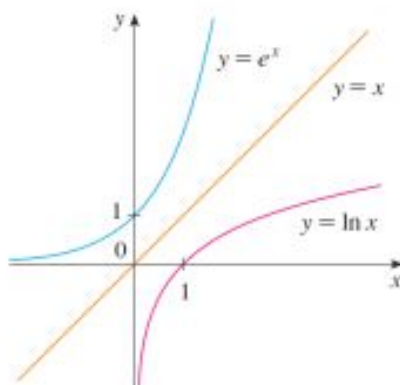


FIGURE 3

20–22 Use Formula 7 to graph the given functions on a common screen. How are these graphs related?

20. $y = \log_2 x$, $y = \log_4 x$, $y = \log_6 x$, $y = \log_8 x$

23–24 Make a rough sketch of the graph of each function. Do not use a calculator. Just use the graphs given in Figures 2 and 3 and, if necessary, the transformations of Section 1.3.

23. (a) $y = \log_{10}(x + 5)$ (b) $y = -\ln x$

25–34 Solve each equation for x .

26. (a) $e^{2x+3} - 7 = 0$

29. $3xe^x + x^2e^x = 0$

35–36 Find the solution of the equation correct to four decimal places.

35. (a) $e^{2+5x} = 100$

(b) $\ln(e^x - 2) = 3$

37–38 Solve each inequality for x .

37. (a) $e^x < 10$

(b) $\ln x > -1$

43. If a bacteria population starts with 100 bacteria and doubles every three hours, then the number of bacteria after t hours is $n = f(t) = 100 \cdot 2^{t/3}$.
- Find the inverse of this function and explain its meaning.
 - When will the population reach 50,000?

45–50 Find the limit.

45. $\lim_{x \rightarrow 3^+} \ln(x^2 - 9)$

49. $\lim_{x \rightarrow \infty} [\ln(1 + x^2) - \ln(1 + x)]$

53–54 Find (a) the domain of f and (b) f^{-1} and its domain.

53. $f(x) = \sqrt{3 - e^{2x}}$

61. On what interval is the function $f(x) = e^{3x} - e^x$ increasing?

95. (a) Use mathematical induction to prove that for $x \geq 0$ and any positive integer n ,

$$e^x \geq 1 + x + \frac{x^2}{2!} + \cdots + \frac{x^n}{n!}$$

- (b) Use part (a) to show that $e > 2.7$.
(c) Use part (a) to show that

$$\lim_{x \rightarrow \infty} \frac{e^x}{x^k} = \infty$$

for any positive integer k .

Attachments

5-1-spread.xlsx

cosine-animation-riemann.wmf

5-1-spread-for-lecture.xlsx