

1.5.1. Calculate $\frac{4^{-3}}{2^{-8}}$, and simplify $\frac{1}{\sqrt[3]{x^4}}$.

1.5.3. Calculate $8^{4/3}$, and simplify $x(3x^2)^3$.

1.5.19. Find the domain of the function $f(x) = \frac{1-e^{x^2}}{1-e^{1-x^2}}$.

1.5.21. Find an exponential function whose graph passes through $(1, 6)$ and $(3, 24)$.

1.5.23. If $f(x) = 5^x$, show that

$$\frac{f(x+h) - f(x)}{h} = 5^x \left(\frac{5^h - 1}{h} \right)$$

1.5.29. Under ideal conditions a certain bacteria population doubles in size every 3 hours. Suppose there are initially 100 bacteria. Find the size of the population after 15 hours, and give a formula for the population after t hours.

1.6.9. Determine whether the function $f(x) = x^2 - 2x$ has an inverse.

1.6.11. Determine whether the function $g(x) = \frac{1}{x}$ has an inverse.

1.6.13. Determine whether the function $f(t)$ describing the height of a football t seconds after kickoff has an inverse.

1.6.17. If $g(x) = 3 + x + e^x$, find $g^{-1}(4)$.

1.6.19. The formula $C = \frac{5}{9}(F - 32)$ expresses Celsius temperature as a function of Fahrenheit temperature. Find a formula for the inverse function and interpret it.

1.6.21. Find a formula for the inverse of $f(x) = 1 + \sqrt{2 + 3x}$.

1.6.23. Find a formula for the inverse of $f(x) = e^{2x-1}$.

1.6.25. Find a formula for the inverse of $y = \ln(x + 3)$.

1.6.35. Find the exact values of $\log_5 125$ and $\log_3 \frac{1}{27}$.

1.6.37. Find the exact values of $\log_2 6 - \log_2 15 + \log_2 20$ and $\log_3 100 - \log_3 18 - \log_3 50$.

1.6.39. Write $\ln 5 + 5 \ln 3$ as a single logarithm.

1.6.41. Write $\frac{1}{3} \ln(x+2)^3 + \frac{1}{2} [\ln x - \ln(x^2 + 3x + 2)^2]$ as a single logarithm.

1.6.51. Solve $e^{7-4x} = 6$ for x .

1.6.53. Solve $2^{x-5} = 3$ for x .

1.6.57. Find the domain of $f(x) = \ln(e^x - 3)$, and find its inverse.

1.6.61. Find the inverse of the function developed in exercise 1.5.29., and explain its meaning. Then, determine when the bacteria population reaches 50,000.

1.6.63. Find the exact values of $\sin^{-1} \frac{\sqrt{3}}{2}$ and $\cos^{-1}(-1)$.

1.6.65. Find the exact values of $\arctan 1$ and $\sin^{-1} \frac{1}{\sqrt{2}}$.

1.6.67. Find the exact values of $\tan(\arctan 10)$ and $\sin^{-1}(\sin(\frac{7\pi}{3}))$.

1.R.TF7. Determine whether the statement “If f has an inverse, then $f^{-1}(x) = \frac{1}{f(x)}$ ” is true or false. If true, explain why; if false, explain why or give a counterexample.

- 1.R.TF9.** Determine whether the statement “If $0 < a < b$, then $\ln a < \ln b$ ” is true or false. If true, explain why; if false, explain why or give a counterexample.
- 1.R.TF11.** Determine whether the statement “If $x > 0$ and $a > 1$, then $\frac{\ln x}{\ln a} < \ln \frac{x}{a}$ ” is true or false. If true, explain why; if false, explain why or give a counterexample.
- 1.R.TF13.** Determine whether the statement “ $\tan^{-1} x = \frac{\sin^{-1} x}{\cos^{-1} x}$ ” is true or false. If true, explain why; if false, explain why or give a counterexample.
- 1.R.23.** If $f(x) = 2x + \ln x$, find $f^{-1}(2)$.
- 1.R.25.** Find the exact values of $e^{2\ln 3}$, $\log_{10} 25 + \log_{10} 4$, $\tan \arcsin \frac{1}{2}$, and $\sin \cos^{-1} \frac{4}{5}$.