

6. Simplify.

- a) $\log_6 9 + \log_6 4$ b) $\log_5 15 - \log_5 3$ c) $\log_4 2 + \log_4 32$
 d) $\log_2 48 - \log_2 6$ e) $\log_3 54 - \log_3 2$ f) $\log_3 9 + \log_3 9$

7. Solve each equation to 5 decimal places, and check.

- a) $2^x = 11$ b) $3^x = 17$ c) $6^x = 5$

8. a) Solve the equations in each list.

- i) $3^x = 2$, $3^x = 4$, $3^x = 8$, $3^x = 16$
 ii) $3^x = 2$, $9^x = 2$, $27^x = 2$, $81^x = 2$

b) How are the roots of the equations in each list in part a related? Explain.

9. Solve.

- a) $5^{x-1} = 9$ b) $2^{x+3} = 6$ c) $7^{-x} = 3$
 d) $3^{1-x} = 5$ e) $\left(\frac{1}{8}\right)^x = 25$ f) $5^{3x} = 41$

10. Express:

- a) 7 as a power of 3 b) 5 as a power of 2 c) 29 as a power of 2
 d) 77 as a power of 8 e) 3 as a power of 0.5 f) 0.45 as a power of 6

11. Determine each logarithm to 5 decimal places, and check.

- a) $\log_3 5$ b) $\log_2 12$ c) $\log_6 55$
 d) $\log_2 3$ e) $\log_2 20$ f) $\log_2 5$

13. Alex invests \$50 000 at an interest rate of 7% compounded monthly. Laura invests \$40 000 at 9.5% compounded annually. After how many years will the two investments be equal in value?

14. a) Determine each quotient to 5 decimal places.

- i) $\frac{\log_2 20}{\log_2 3}$ ii) $\frac{\log_6 20}{\log_6 3}$ iii) $\frac{\log_8 20}{\log_8 3}$

- b) Refer to *Example 1*, where the solution contains the line $x = \frac{\log 20}{\log 3}$. Compare the quotients in part a with this value of x . What do you notice?
 c) In part b, you should have found that the quotients are the same, regardless of the base used for the logarithms. Explain why this is true.
 d) The $\boxed{\text{LN}}$ key on your calculator determines logarithms of numbers to a base different from 10. Use this key to solve the equation in *Example 1*.

1. Explanations may vary.
 a) 0.699, 1.699, 2.699, 3.699, 4.699
 b) 0.699, 1.398, 2.097, 2.796, 3.495
 2. Explanations may vary.
 a) All are approximately 1.556.
 b) All are approximately 0.301.
 4. Explanations may vary.
 a) 0.301, 0.602, 0.903, 1.204, 1.505
 b) 1 c) 3 d) 3 e) 4
 7. a) 3.459 43 b) 2.578 90 c) 0.898 24
 8. a) i) 0.630 93, 1.261 86, 1.892 79, 2.523 72
 ii) 0.630 93, 0.315 46, 0.210 31, 0.157 73
 b) Explanations may vary.
 i) Each root is a multiple of the first root.
 ii) Each root is a factor of the first root.
 8. a) 2.365 21 b) -0.415 04 c) -0.564 58
 d) -0.464 97 e) -1.547 95 f) 0.769 12
 0. a) 3.171 24 b) 2.321 93 c) 2.857 98
 d) 8.088 93 e) 0.5-1.584 96 f) 6-0.445 66
 1. a) 1.464 97 b) 3.584 96 c) 2.236 54
 d) 1.584 96 e) 4.321 93 f) 2.321 93
 2. a) $\log_2 2$, $\log_2 3$, $\log_2 4$, $\log_2 5$, $\log_2 x$
 b) $\log_2 x$, $1 + \log_2 x$, $2 + \log_2 x$, $3 + \log_2 x$, $4 + \log_2 x$
 3. About 11.7 years
 4. a) i) 2.726 83 ii) 2.726 83 iii) 2.726 83
 b) The quotients are equal.
 d) 2.726 83