Worksheet 1

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Exercises

Simplify the expressions in Exercises 1–6 completely.

1. $e^{\ln(1/2)}$

2. $10^{\log(AB)}$

3. $5e^{\ln(A^2)}$

4. $\ln(e^{2AB})$

5. $\ln(1/e) + \ln(AB)$

6. $2\ln\left(e^A\right) + 3\ln B^e$

For Exercises 7–18, solve for x using logs.

7. $3^x = 11$

8. $17^x = 2$

9. $20 = 50(1.04)^x$

10. $4 \cdot 3^x = 7 \cdot 5^x$

11. $7 = 5e^{0.2x}$

12. $2^x = e^{x+1}$

13. $50 = 600e^{-0.4x}$

14. $2e^{3x} = 4e^{5x}$

15. $7^{x+2} = e^{17x}$

16. $10^{x+3} = 5e^{7-x}$

17. $2x - 1 = e^{\ln x^2}$

18. $4e^{2x-3} - 5 = e$

For Exercises 19–24, solve for t. Assume a and b are positive constants and k is nonzero.

19. $a = b^t$

20. $P = P_0\, a^t$

21. $Q = Q_0\, a^{nt}$

22. $P_0\, a^t = Q_0\, b^t$

23. $a = be^t$

24. $P = P_0\, e^{kt}$

In Exercises 25–28, put the functions in the form $P = P_0 e^{kt}$.

25. $P = 15(1.5)^t$

26. $P = 10(1.7)^t$

27. $P = 174(0.9)^t$

28. $P = 4(0.55)^t$

Find the inverse function in Exercises 29–31.

29. $p(t) = (1.04)^t$

30. $f(t) = 50e^{0.1t}$

31. $f(t) = 1 + \ln t$

32. The population of a region is growing exponentially. There were 40,000,000 people in 2000 ($t = 0$) and 48,000,000 in 2010. Find an expression for the population at any time t, in years. What population would you predict for the year 2020? What is the doubling time?

33. One hundred kilograms of a radioactive substance decay to 40 kg in 10 years. How much remains after 20 years?

34. A culture of bacteria originally numbers 500. After 2 hours there are 1500 bacteria in the culture. Assuming exponential growth, how many are there after 6 hours?

35. The population of the US was 281.4 million in 2000 and 308.7 million in 2010.[23] Assuming exponential growth,

(a) In what year is the population expected to go over 350 million?

(b) What population is predicted for the 2020 census?