Name

9-8B Lesson Master

Questions on SPUR Objectives
See Student Edition pages 656–659 for objectives.

VOCABULARY

1. **Fill in the Blank** Logarithms to the base _____ are called *natural logarithms*.

In 2–9, write the logarithmic equation as an exponential equation.

2. $\ln 15 \approx 2.708$ _____
3. $\ln 1.5 \approx 0.405$ _____
4. $\ln 42 \approx 3.738$ _____
5. $\ln 0.2 \approx -1.609$ _____
6. $\ln 2.4 \approx 0.875$ _____
7. $\ln 3{,}000 \approx 8.006$ _____
8. $\ln 7 \approx 1.95$ _____
9. $\ln 0.01 \approx -4.61$ _____

In 10–15, write the exponential equation as a logarithmic equation.

10. $e^{-1.3} \approx 0.273$ _____
11. $e^{15} \approx 3{,}269{,}017$ _____
12. $e^{7} \approx 1097$ _____
13. $e^{1.5} \approx 4.482$ _____
14. $e^{-\frac{1}{2}} \approx 0.607$ _____
15. $e^{\frac{7}{4}} \approx 5.755$ _____

SKILLS Objective A

In 16–21, evaluate. Round to the nearest hundredth when necessary.

16. $\ln 95$ _____
17. $\ln 0.03$ _____
18. $\ln 8$ _____
19. $\ln 0.44$ _____
20. $\ln 5068$ _____
21. $\ln 0.05$ _____

In 22–35, give an exact answer. Do all work in your head; check with a CAS if necessary.

22. $\ln e^{8}$ _____
23. $\ln e^{\frac{1}{2}}$ _____
24. $\ln e^{-\frac{2}{5}}$ _____
25. $\ln e^{14}$ _____
26. $\ln e$ _____
27. $\ln e^{0}$ _____
28. $\ln e^{\frac{4}{3}}$ _____
29. $5 \ln e^{2}$ _____
30. $-\ln e^{-0.02}$ _____
31. $5 \ln e^{\frac{1}{5}}$ _____
32. $2 \ln e^{-4.2}$ _____
33. $3.5 \ln e^{-\frac{3}{7}}$ _____
34. $\frac{1}{8} \ln e^{-1}$ _____
35. $\frac{5}{3} \ln e^{3}$ _____

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PROPERTIES Objective E

36. **True or False** Given the function f where $f(x) = \ln x$,

a. domain of f is $\{x \mid x > 0\}$. _____

b. range of f is the set of all reals. _____

c. domain of f^{-1} is $\{x \mid x > 0\}$. _____

d. range of f^{-1} is the set of all reals. _____

37. Explain why, if $\ln(e^x) = a$, $x = a$.

_____

_____

_____

USES Objective I

In 38–40, suppose an account pays an annual interest rate r compounded continuously. The formula $t = \frac{\ln g}{r}$ can be used to determine the number of years t for the investment to grow to g times what it was, assuming that the money is left untouched.

38. How long will it take an investment to double if the account pays

a. 5% compounded continuously? _____

b. 7% compounded continuously? _____

c. 10% compounded continuously? _____

39. If \$8000 is invested at 8% compounded continuously, in how many years will the account be worth \$12,000? _____

40. What annual rate of interest compounded continuously would be necessary for an account to triple in

a. 20 years? _____ b. 15 years? _____

c. 10 years? _____ d. 5 years? _____

41. The maximum velocity v of a rocket is $v = c \cdot \ln R$, where c is the velocity of the exhaust and R is the ratio of the mass of the rocket with fuel to its mass without fuel. Find R for a rocket if $c = 2000 \frac{\text{m}}{\text{sec}}$ and $v = 2200 \frac{\text{m}}{\text{sec}}$. _____