P 490

48. $5^{\log_5 x} = \boxed{x}$

Why?

exp. form $5^{\log_5 x} = n$

log form $\log_5 n = \log_5 x$

therefore $n = \boxed{x}$

52. $\log_4 16^x = \boxed{2x}$

Why? $\log_4 16^x = n$

$4^n = 16^x$

$4^n = 4^{2x}$

57. $y = \log_{1/4} x$

$x = \log_{1/4} y$

$\left(\frac{1}{4}\right)^x = y$

63. $y = \ln(x+2)$

$y = \log_e (x+2)$

$x = \log_e (y+2)$

$e^x = y+2$

$e^x - 2 = y$

68. $y = \ln x - 1$

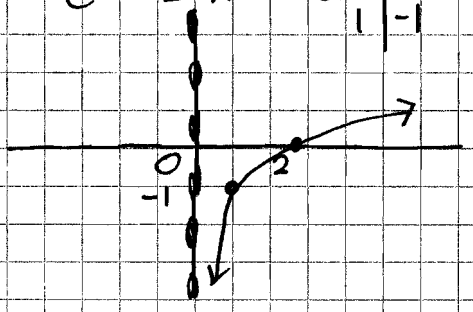
$1 + y = \log_e x$

$e^{y+1} = x$

D: $x > 0$

R: all reals

x	y
2.7	0
1	-1

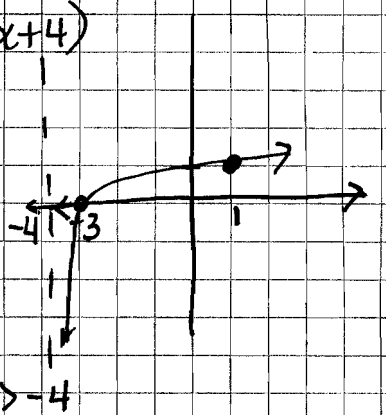


73. $y = \log_5 (x+4)$

$5^y = x+4$

$5^y - 4 = x$

x	y
-3	0
1	1



D: $x > -4$

R: all real #s

79.

$R = .67 \log(.37 * 15{,}500{,}000{,}000) + 1.46$

$R \approx 8$ magnitude

4.9b

9. $\log_2 3 = \log_2\left(\frac{21}{7}\right)$

$= \log_2 21 - \log_2 7$

$\approx 2.81 - 4.39 \approx \boxed{1.58}$

11. $\log_2 147 = \log_2 (21 \cdot 7)$

$= \log_2 21 + \log_2 7$

(sub. in decimals)

39. $\log_8 64x^2$

$(8^2 = 64) = \underbrace{\log_8 64} + \log_8 x^2$

$= \boxed{2 + 2\log_8 x}$

43. $\ln\left(\frac{3y^4}{x^3}\right)$

$= \ln 3y^4 - \ln x^3$

$= \ln 3 + \ln y^4 - \ln x^3$

$= \boxed{\ln 3 + 4\ln y - 3\ln x}$

47. $\ln 16 - \ln 44$

$= \ln\left(\frac{16}{4}\right)$

$= \boxed{\ln 4}$

51. $7\log_4 2 + 5\log_4 x + 3\log_4 y$

$= \log_4 2^7 + \log_4 x^5 + \log_4 y^3$

$= \log_4 (128 \cdot x^5 \cdot y^3)$

$= \log_4 (128x^5y^3)$

55. $= \ln\left(\frac{3}{x}\right)^3 + \ln\left(\frac{x}{9}\right)$

$= \ln\left(\frac{27}{x^3} \cdot \frac{x}{9}\right)$

$= \ln\left(\frac{3}{x^2}\right)$

Extra fun

6. $16^{-3/4} = x$

$$\frac{1}{(\sqrt[4]{16})^3} = x$$

$$\frac{1}{2^3} = x = \boxed{\frac{1}{8}}$$

7. $\log_2 \sqrt[3]{M^2N}$

$= \log_2 M^{2/3} N^{1/3}$

$= \log_2 M^{2/3} + \log_2 N^{1/3}$

$= \boxed{2/3 \log_2 M + 1/3 \log_2 N}$

8. $\log_2 \frac{4}{MN}$

$= \log_2 4 - \log_2 MN$

$= 2 - (\log_2 M + \log_2 N)$

$= \boxed{2 - \log_2 M - \log_2 N}$

9. $\log_5 x - \log_5 y + 2$

$= \log_5 x - \log_5 y + \log_5 25$

$= \log_5 \frac{x}{y} \cdot 25$

$= \boxed{\log_5 \left(\frac{25x}{y}\right)}$

10. $\log_7 \sqrt{7}$

$7^x = 7^1 \cdot 7^{1/2}$

$7^x = 7^{\boxed{3/2}}$

11. $\log_2 \sqrt[3]{1/4}$

$2^x = \sqrt[3]{\frac{1}{2^2}}$

$2^x = \sqrt[3]{2^{-2}}$

$2^x = 2^{(-2/3)}$

12. $2 \log 5 + \log 4$

$= \log (5^2 \cdot 4)$

$= \log_{10} 100$

$10^x = 100$

$\boxed{x = 2}$

13. $\log_4 40 - \log_4 5$

$= \log_4 \left(\frac{40}{5}\right)$

$= \log_4 (8)$

$4^x = 8$

$2^{2x} = 2^3$

$\boxed{x = 3/2}$