

SOLVING LOG EQUATIONS DAY 2

NAME Key Spr 17

SOLVE.

1. $\log_3 10 - \log_3 5 = \log_3 n$

$\log_3 \frac{10}{5} = \log_3 n$

$2 = n$

2. $-3 \cdot 3^{n+10} = -92$

$3^{n+10} = \frac{92}{3}$

$\log_3 \frac{92}{3} = n+10$

$3.11591 = n+10$

$-6.8841 = n$

3. $\ln -x = 4$

$e^4 = -x$

$-e^4 = x$

$x = -54.5982$

4. $\ln 3x^2 - \ln 3 = 4$

$\ln \frac{3x^2}{3} = 4$

$\ln x^2 = 4$

$x^2 = e^4$

$\pm \sqrt{e^4} = x$

$x = \pm 7.3891$

5. $\ln 5 - \ln(3x+7) = 1$

$\ln \frac{5}{3x+7} = 1$

$e^1 = \frac{5}{3x+7}$

$(3x+7)e^1 = 5$

$3x+7 = \frac{5}{e^1}$

$3x+7 = 1.8394$

$3x = -5.1606$
 $x = -1.7202$

6. $\log_{14}(4n+6) = \log_{14}(6-n)$

$4n+6 = 6-n$

$5n = 0$

$n = 0$

7. $e^{2x} - 4e^x - 5 = 0$

*pretend:

$x^2 - 4x - 5 = 0$
 $(x-5)(x+1) = 0$

reality:

$(e^x - 5)(e^x + 1) = 0$

$e^x = 5$ $e^x = -1$

$\ln 5 = x$ ~~$\ln -1 = x$~~

$x = 1.6094$

8. $e^{8x+1} + 6 = 12$

$e^{8x+1} = 6$

$\ln 6 = 8x+1$

$1.79176 = 8x+1$

$.79176 = 8x$

$x = .099$

9. $9 \log_{12} x - 7 = 11$

$9 \log_{12} x = 18$

$\log_{12} x = 2$

$12^2 = x$

$x = 144$

10. $\ln x - \ln(x-1) = \ln 3$

$\ln \frac{x}{x-1} = \ln 3$

$\frac{x}{x-1} = 3$

$x = 3(x-1)$

$x = 3x - 3$

$-2x = -3$

$x = 3/2$

11. $\ln(-4x) = \ln(4x+8)$

$-4x = 4x+8$

$-8x = 8$

$x = -1$

12. $-3 \cdot 11^{7n} + 5 = -3$

$-3 \cdot 11^{7n} = -8$

$11^{7n} = 8/3$

$\log_{11} 8/3 = 7n$

$.40904 = 7n$

$n = .0584$

13. $\log_5(y^2 + 5y + 6) = \log_5(y+3) + \log_5 4$

$\log_5(y^2 + 5y + 6) = \log_5(4y+12)$

$y^2 + 5y + 6 = 4y + 12$

$y^2 + y - 6 = 0$

$(y+3)(y-2) = 0$

~~$y = -3$~~

$y = 2$

14. $2 \log(y+2) = 1 + \log(y^2 - 4)$

$2 \log(y+2) - \log(y^2 - 4) = 1$

$\log(y+2)^2 - \log(y^2 - 4) = 1$

$\log \frac{(y+2)^2}{y^2 - 4} = 1$

$\log \frac{(y+2)(y+2)}{(y+2)(y-2)} = 1$

$10^1 = \frac{y+2}{y-2}$

$\log y - \log 20 = y+2$

$9y = 22$

$y = 2.444$

15. $\ln^2 x + \ln x^3 + 2 = 0$

pretend: $x^2 + 3x + 2 = 0$
 $(x+2)(x+1) = 0$

reality: $(\ln x + 2)(\ln x + 1) = 0$
 $\ln x = -2$ $\ln x = -1$
 $e^{-2} = x$ $e^{-1} = x$

$x = .1353$ $x = .3679$

16. $\log(n-6) - 7 = -7$

$\log(n-6) = 0$
 $10^0 = n-6$
 $1 = n-6$

$7 = n$

17. $\log_3(x^2 - 9) - \log_3(x + 3) = 1$

$\log_3 \frac{x^2 - 9}{x + 3} = 1$
 $\log_3 \frac{(x+3)(x-3)}{x+3} = 1$

$3^1 = x-3$
 $6 = x$

18. $-4 \log_{11}(-10x + 1) = -8$

$\log_{11}(-10x + 1) = 2$
 $11^2 = -10x + 1$
 $121 = -10x + 1$
 $120 = -10x$

$x = -12$

19. $\ln x + \sqrt{\ln x} = 12$

pretend: $x^2 + x - 12 = 0$
 $(x+4)(x-3) = 0$

reality: $\ln x + (\ln x)^{1/2} - 12 = 0$
 $\ln x + \ln^{1/2} x - 12 = 0$
 $(\ln^{1/2} x + 4)(\ln^{1/2} x - 3) = 0$
 $(\ln^{1/2} x = -4)$ $(\ln^{1/2} x = 3)$
 $\ln x = 16$ $\ln x = 9$
 $e^{16} = x$ $e^9 = x$

$x = 8,886,110.521$
 *doesn't work when plugged in!

22. $\ln x - \ln x^7 + 10 = 0$
 $x = 8103.8$

20. $\ln x - \ln x^7 + 10 = 0$

pretend: $x^2 - 7x + 10 = 0$
 $(x-5)(x-2) = 0$

reality: $(\ln x - 5)(\ln x - 2) = 0$
 $\ln x = 5$ $\ln x = 2$
 $e^5 = x$ $e^2 = x$

$x = 148.4132$ $x = 7.3891$

21. $\ln x + \sqrt{\ln x} = 12$

23. $2 \log^2 x = 2 + 3 \log x$

pretend: $2x^2 - 3x - 2 = 0$
 $(2x+1)(x-2) = 0$

reality: $(2 \log x + 1)(\log x - 2) = 0$
 $2 \log x = -1$ $\log x = 2$
 $\log x = -1/2$ $10^2 = x$
 $10^{-1/2} = x$

$x = .3162$

$x = 100$

24. $\log_5 \sqrt{x} + \log_5 \sqrt{6x+5} = 1$

$\log_5 \sqrt{x(6x+5)} = 1$
 $(5^1)^2 = (\sqrt{x(6x+5)})^2$
 $25 = x(6x+5)$
 $25 = 6x^2 + 5x$
 $0 = 6x^2 + 5x - 25$
 $0 = (3x-5)(2x+5)$
 $x = 5/3$ $x = -5/2$

Doesn't work when plugged in!