

Solve each equation. Show all work.

1.  $e^{2x} - 8e^x - 20 = 0$  treat it as:  
 $x^2 - 8x - 20 = 0$   
 $(e^x - 10)(e^x + 2) = 0$   $(x-10)(x+2)$

$e^x - 10 = 0$      $e^x + 2 = 0$

$e^x = 10$      $e^x = -2$

$\ln 10 = x$      ~~$\ln -2 = x$~~

$x = 2.3026$

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

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

$(\ln x + 1)(\ln x + 2) = 0$

$\ln x + 1 = 0$      $\ln x + 2 = 0$

$\ln x = -1$      $\ln x = -2$

$e^{-1} = x$      $e^{-2} = x$

$x = .3679$

$x = .1353$

5.  $\ln^2 x - \ln x^7 + 10 = 0$

$\ln^2 x - 7 \ln x + 10 = 0$

$(\ln x - 5)(\ln x - 2) = 0$

$\ln x - 5 = 0$      $\ln x - 2 = 0$

$\ln x = 5$      $\ln x = 2$

$e^5 = x$      $e^2 = x$

$x = 148.4132$

$x = 7.3891$

2.  $8e^x + e^{2x} = -15$  must put in correct order

$e^{2x} + 8e^x + 15 = 0$  treat it as:  
 $x^2 + 8x + 15 = 0$

$(e^x + 5)(e^x + 3) = 0$      $(x+5)(x+3) = 0$

$e^x + 5 = 0$      $e^x + 3 = 0$

~~$\ln -5 = x$~~      ~~$\ln -3 = x$~~

$\emptyset$

4.  $\log^2 x = 12 + \log x$

treat it as:

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

$\log^2 x - \log x - 12 = 0$

$(\log x - 4)(\log x + 3) = 0$

$\log x - 4 = 0$

$\log x = 4$

$10^4 = x$

$x = 10,000$

$\log x + 3 = 0$

$\log x = -3$

$10^{-3} = x$

$x = .001$

treat it as:

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

6.  $4e^{2x} + 4e^x - 8 = 0$

$4(e^{2x} + e^x - 2) = 0$

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

$e^x - 1 = 0$      $e^x + 2 = 0$

$e^x = 1$      $e^x = -2$

$x = \ln 1$      ~~$x = \ln -2$~~

$x = 0$

treat it as:

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

key

Solve each equation. Round to 4 decimal places if necessary.

11)  $64^{-2m+3} = 4^{-2m}$

$(4)^{3(-2m+3)} = 4^{-2m}$

$-6m+9 = -2m$

$9 = 4m$

$m = \frac{9}{4}$

13)  $\log_{12}(2x+8) = \log_{12}(-x-2)$

$2x+8 = -x-2$

$3x = -10$

$x = -\frac{10}{3}$

15)  $\ln x + \ln(x+29) = \ln 62$

~~$\ln(x^2+29x) = \ln 62$~~

$x^2+29x-62=0$

$(x+31)(x-2)=0$

~~$x = -31$~~   $x = 2$

17)  $-3 \cdot 3^{-2x} - 4 = -18$

$-3 \cdot 3^{-2x} = -14$

$1.4022 = -2x$

$3^{-2x} = 4.6667$

$\log_3 4.6667 = -2x$

~~$x = 0.7011$~~   
 $x = -0.7011$

19)  $\log_3 5x + \log_3 7 = \log_3 6$

$\log_3 35x = \log_3 6$

$x = \frac{6}{35}$

$.1714$

21)  $-7 \ln(-6k-4) = -7$

$\ln(-6k-4) = 1$

$e^1 = -6k-4$

$6.71828 = -6k$

$k = -1.1197$

23)  $e^{p-5} + 1 = 23$

$e^{p-5} = 22$

$\ln 22 = p-5$

$3.0910 = p-5$

$p = 8.091$

12)  $-4 \cdot 2^{10x+5} = -3.1$

$2^{10x+5} = .775$

$\log_2 .775 = 10x+5$

$-.36773 = 10x+5$

$-5.3677 = 10x$

$x = -.5368$

14)  $\log -5x - \log 7 = 2$

$\log \frac{-5x}{7} = 2$

$10^2 = \frac{-5x}{7}$

$700 = -5x$

$x = -140$

16)  $\log_2(x+9) + 10 = 9$

$\log_2(x+9) = -1$

$2^{-1} = x+9$

$\frac{1}{2} = x+9$

$x = -8.5$

or  $-\frac{17}{2}$

18)  $\log_7 x^2 - \log_7 4 = 4$

$\log_7 \frac{x^2}{4} = 4$

$7^4 = \frac{x^2}{4}$

$2401 = \frac{x^2}{4}$

$x^2 = 9604$

$x = \pm 98$

20)  $\log_{14}(n^2+10) = \log_{14}(-9n+2)$

$n^2+10 = -9n+2$

$n^2+9n+8=0$

$(n+8)(n+1)=0$

$n = -1$

$n = -8$

22)  $\ln(-3x-4) - 7 = -6$

$\ln(-3x-4) = 1$

$e^1 = -3x-4$

$x = -2.2394$

24)  $6.4e^{n-3.7} = 18$

$e^{n-3.7} = 2.8125$

$\ln 2.8125 = n-3.7$

$1.03407 = n-3.7$

$n = 4.7341$