

## HW 3.2.1: Solving Exponential and Logarithmic Equations

For exercises 1 – 12, solve the equation analytically, using the property that the natural base and the natural log are inverse:  $e^{\ln(x)} = x$  and  $\ln(e^x) = x$ . Completely simplify answers.

1.  $e^{-4680t} = \frac{1}{3}$

2.  $350e^{0.4n} = 1400$

3.  $2400(1 - e^{3x}) = 2000$

4.  $\frac{450}{1 + 9e^{-\frac{2}{3}k}} = 225$

5.  $e^{4x} = 8e^x$

6.  $9e^{3x} = 27e^{-7x}$

7.  $6\ln x - 3 = 2 - \ln x$

8.  $\ln x^3 - \ln x^6 + \ln x^4 = 2$

9.  $3\ln x + 5\ln 3 = \ln\left(\frac{3}{x}\right)$

10.  $\ln(x^2 - 63) = 0$

11.  $2\ln x + \ln 2 = \ln(x + 3)$

12.  $\ln x + \ln(2x + 5) = \ln 3$

For exercises 13 – 20, solve the equation analytically, using the log properties. Completely simplify answers.

13.  $4^{-2t} = 64$

14.  $7(4^{6-2x}) + 13 = 41$

15.  $3^{3t-8} = 81$

16.  $2\log_5(6x + 5) = 6$

17.  $\log_2(x - 6) + \log_2 x = 4$

18.  $\log_7(2x) + \log_7\left(x - \frac{7}{2}\right) = 2$

19.  $\log_4(2x^2 + 7x - 30) - \log_4(x + 6) = 3$

20.  $\log_6(16x - 12) - \log_6(x - 2) = 2$



In exercises 21 – 25, sketch a graph of the given function without using a calculator; make sure to identify the asymptote and a fixed point.

21.  $y = \ln(x - 3)$

22.  $y = 2 \ln x$

23.  $y = -\ln(x + 1)$

24.  $y = \ln(x + 1) - 3$

25.  $y = -\ln(x - 2) + 1$



Selected Answers:

1.  $\frac{\ln(3)}{4680}$

3.  $-\frac{\ln(6)}{3}$

5.  $\ln(2)$

7.  $(\sqrt[3]{e})^5$

9.  $\frac{1}{3}$

11.  $\frac{3}{2}$

13.  $-\frac{3}{2}$

15. 4

17. 8

19.  $\frac{69}{2}$

