7.3 Exponential and Logarithmic Problem Solving Practice

Solve, rounding to three significant digits.

1. $10^{-x} = 0.0347$

$\log 10^{-x} = \log 0.0347$

$-x = \log 0.0347$

$x = -\log 0.0347$

$x \approx 1.460$

2. $10^{3x+1} = 92$

$\log 10^{3x+1} = \log 92$

$3x+1 = \log 92$

$3x = -1 + \log 92$

$x = \frac{-1+\log 92}{3}$

$x \approx .321$

3. $e^{x} = 3.65$

$\ln e^{x} = \ln 3.65$

$x = \ln 3.65$

$x \approx 1.295$

4. $e^{2x-1} + 68 = 207$

$e^{2x-1} = 139$

$\ln e^{2x-1} = \ln 139$

$2x-1 = \ln 139$

$2x = 1 + \ln 139$

$x = \frac{1+\ln 139}{2}$

$x \approx 2.967$

5. $\log_5 x = 2$

$5^2 = x$

$25 = x$

6. $80e^{0.045x} = 240$

$e^{0.045x} = 3$

$\ln e^{0.045x} = \ln 3$

$0.045x = \ln 3$

$x = \frac{\ln 3}{0.045}$

$x \approx 24.414$

7. $\log 5 + \log x = 2$

$\log 5x = 2$

$10^2 = 5x$

$100 = 5x$

$20 = x$

8. $\log x + \log (x-3) = 1$

$\log(x^2-3x) = 1$

$10^1 = x^2-3x$

$0 = x^2-3x-10$

$0 = (x-5)(x+2)$

$0 = x-5$ or $0 = x+2$

$5 = x$ or $-2 \neq x$

check for extraneous solutions!

The argument must be >0, so $x \neq -2$

9. $\log (5-2x) = \log(3x+1)$

$5-2x = 3x+1$

$5 = 5x+1$

$4 = 5x$

$\frac{4}{5} = x$

10. $\ln x = \ln(2x-1) - \ln(x-2)$

$\ln x = \ln \frac{2x-1}{x-2}$

$x = \frac{2x-1}{x-2}$

$x^2-2x = 2x-1$

$x^2-4x+1=0$

Doesn't Factor

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

$x = \frac{-(-4) \pm \sqrt{(-4)^2-4(1)(1)}}{2(1)}$

$x = \frac{4 \pm \sqrt{16-4}}{2}$

$x = \frac{4 \pm \sqrt{12}}{2}$

$x = \frac{4 \pm 2\sqrt{3}}{2}$

$x = 2 \pm \sqrt{3}$

$x \approx 3.732$ or $x \not\approx 0.2679$

$x \neq 0.2679$ since it gives negative argument

11. $3 - \log(x+3) = 5$

$-\log(x+3) = 2$

$\log(x+3) = -2$

$10^{-2} = x+3$

$\frac{1}{100} = x+3$

$.01 = x+3$

$-2.99 = x$

12. $3^{x+1} = 28$

$\log 3^{x+1} = \log 28$

$(x+1)\log 3 = \log 28$

$x+1 = \frac{\log 28}{\log 3}$

$x = \frac{\log 28}{\log 3} - 1$

$x \approx 2.033$