Solving Logarithmic Equation Homework

Solve each of the following equations.

1. $\log 9 + \log x = 1$

$\log_{10}(9x) = 1$

$10^1 = 9x$

$10 = 9x$

$x = \frac{10}{9}$

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

$\ln_e(x+2) = 3$

$e^3 = 2x + 4$

$x = \frac{e^3 - 4}{2}$

3. $\log_6 x - \log_6 (x-3) = 1$

$\log_6\left(\frac{x}{x-3}\right) = 1$

$(x-3)6^1 = \frac{x}{x-3}(x-3)$

$6x - 18 = x$

$5x = 18$

$x = \frac{18}{5}$

4. $\log_5 9 - \log_5 (x+10) = 1$

$\log_5\left(\frac{9}{x+10}\right) = 1$

$5^1 = \frac{9}{x+10}$

$5(x+10) = 9$

$5x + 50 = 9$

$5x = -41$

$x = \frac{-41}{5}$

5. $\log (3x + 7) = 0$

$10^0 = 3x + 7$

$1 = 3x + 7$

$-6 = 3x$

$x = -2$

6. $\log_4 (x^2 + 3x) - \log_4 (x + 5) = 1$

$\log_4\left(\frac{x^2+3x}{x+5}\right) = 1$

$4^1 = \frac{x^2+3x}{x+5}$

$4(x+5) = x^2 + 3x$

$4x + 20 = x^2 + 3x$

$0 = x^2 - x - 20$

$0 = (x-5)(x+4)$

$x = 5$ $\quad x = -4$

***When solving logarithmic equations, we need to check for extraneous solutions.

7. $\log (x+2) + \log (x+5) = 1$

$\log_{10}(x+2)(x+5) = 1$

$10^1 = (x+2)(x+5)$

$10 = x^2 + 7x + 10$

$0 = x^2 + 7x$ ← gcf & factor

$0 = x(x+7)$

$x = 0$ $\quad x = -7$

8. $2\ln(x+2) - \ln(-x) = 0$

$\ln(x+2)^2 - \ln(-x) = 0$

$\ln_e\left[\frac{(x+2)^2}{-x}\right] = 0$

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

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

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

$0 = x^2 + 5x + 4$

factor

$0 = (x+4)(x+1)$

$x = -4$

$x = -1$