1.

a. $\log_3(x+2) = 5$

b. $\log_2(x-1) = 3$

c. $\log_{\frac{1}{2}}(x+3) = -2$

d. $\log_2(-x-1) = 1$

e. $\log x = 3$

$x = -3$

$x = 1$

$x = 241$

$x = 9$

$x = 1000$

2.

a. $\log_2 x = 3$ $\quad x = 8 > 0$

$x = 2^3$

$x = 8$

b. $\log_5 x = -1$ $\quad x = \frac{1}{5} > 0$

$x = 5^{-1}$

$x = \frac{1}{5}$

c. $\log_3(x+2) = 2$ $\quad x+2 = 7+2 = 9 > 0$

$x+2 = 3^2$

$x+2 = 9$

$x = 9-2$

$x = 7$

d. $3.\log_5 x = 3$ $\quad x = 5 > 0$

$3\log_5(x) : 3 = 3 : 3$

$\log_5 x = 1$

$x = 5^1$

$x = 5$

3.

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

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

$\log\left(\frac{x-1}{x+1}\right) = \log(2) - \log(3)$

$\log\left(\frac{x-1}{x+1}\right) = \log\left(\frac{2}{3}\right)$

$\frac{x-1}{x+1} = \frac{2}{3}$

$3(x-1) = 2(x+1)$

$3x-3 = 2x+2$

$3x-3-2x = 2$

$x = 2+3$

$x = 5$

b. $\log_2(x+3) - \log_2(x-5) = 3$

$\log_2\left(\frac{x+3}{x-5}\right) = 3$

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

$\frac{x+3}{x-5} = 8$

$x+3 = 8(x-5)$

$x+3 = 8x-40$

$x+3-8x = -40$

$-7x = -40-3$

$-7x = -43$

$-7x : (-7) = -43 : (-7)$

$x = \frac{43}{7}$

c. $\log(x-1) - \log(x-3) = \log 2$

$\log\left(\frac{x-1}{x-3}\right) = \log 2$

$\frac{x-1}{x-3} = 2$

$(x-3) \cdot \left(\frac{x-1}{x-3}\right) = 2(x-3)$

$x-1 = 2x-6$

$x-1-2x = -6$

$x-2x = -6+1$

$-x = -5$

$-1.(-x) = -1.(-5)$

$x = 5$

d. $\log_3(x^2-6x-7) - \log_3(x-7) = \log_2 4$

$\log_3\left(\frac{x^2-6x-7}{x-7}\right) = \log_2(2^2)$

$\log_3\left(\frac{x^2+x-7x-7}{x-7}\right) = 2$

$\log_3\left(\frac{x.(x+1)-7(x+1)}{x-7}\right) = 2$

$\log_3\left(\frac{(x+1).(x-7)}{x-7}\right) = 2$

$\log_3(x+1) = 2$

$x+1 = 3^2$

$x+1 = 9$

$x = 9-1 \rightarrow x = 8$