

Practice: Log and Exponential Equations R10

Solve for x in each of the following.

1) $3^{x+5} = 27$

$$3^{x+5} = 3^3$$

$$x+5 = 3$$

$$x = -2$$

2) $\left(\frac{1}{3}\right)^x = 27^{x-1}$

$$3^{-x} = (3^3)^{x-1}$$

$$-x = 3x - 3$$

$$-4x = -3$$

$$x = \frac{3}{4}$$

3) $\log_2(x+1) + \log_2 x = \log_2 6$

$$\log_2 (x+1)(x) = \log_2 6$$

$$(x+1)(x) = 6$$

$$x^2 + x = 6$$

$$x^2 + x - 6 = 0$$

$$(x+3)(x-2) = 0$$

$$x = \cancel{-3} \quad x = 2$$

4) $\log_5(3x+1) + \log_5(x-3) = 3$

$$\log_5(3x+1)(x-3) = 3$$

$$5^3 = (3x+1)(x-3)$$

$$125 = 3x^2 - 9x + 1 - 3$$

$$0 = 3x^2 - 8x - 128$$

$$0 = (3x+16)(x-8)$$

$$x = \frac{-16}{3}$$

$$x = 8$$

* Use the quadratic formula if you have trouble factoring

$$* \ln e = 1 *$$

$$5) e^x = 5^{x-1}$$

$$\ln e^x = \ln 5^{(x-1)}$$

$$x \ln e = (x-1) \ln 5$$

$$x = x \ln 5 - \ln 5$$

$$x - x \ln 5 = -\ln 5$$

$$x(1 - \ln 5) = -\ln 5$$

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

$$x = 2.641$$

$$6) 2(6)^x = 5^{x+1}$$

$$\log(2(6)^x) = \log 5^{(x+1)}$$

$$\log 2 + \log 6^x = (x+1) \log 5$$

$$\log 2 + x \log 6 = x \log 5 + \log 5$$

$$x \log 6 - x \log 5 = \log 5 - \log 2$$

$$x(\log 6 - \log 5) = \log 5 - \log 2$$

$$x = \frac{\log 5 - \log 2}{\log 6 - \log 5}$$

$$x = 5.026.$$

* Answers should be correct to
3 decimal places +.