

Name _____

Alg3-4 – U3IF2 Solving Exponential and Logarithmic Equations

Solve the following equations:

1. $8^t = 2^{t+1}$

$$(2^3)^t = 2^{t+1}$$

$$3t = t + 1$$

$$-t \quad -t$$

$$2t = 1$$

$$t = \frac{1}{2}$$

6. $\log(4t) = 12$

$$10^{12} = 4t$$

$$\frac{1 \times 10^{12}}{4} = t$$

$$t = 2.5 \times 10^{11}$$

2. $17 = 3^x$

$$\log 17 = \log 3^x$$

$$\log 17 = x \log 3$$

$$x = \frac{\log 17}{\log 3} = 2.58$$

7. $-1 = \log(x+3)$

$$10^{-1} = x+3$$

$$.1 = x+3$$

$$-2.9 = x$$

3. $\log_4(x+1) = \log_4 3x$

$$x+1 = 3x$$

$$1 = 2x$$

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

8. $\log(x+3) = \frac{1}{2}$

$$10^{\frac{1}{2}} = x+3$$

$$-3 \quad -3$$

$$.162 = x$$

4. $64 + 10^{t+12} = 74$

$$10^{t+12} = 10$$

$$t+12 = 1$$

$$t = -11$$

9. $1 = \log_4 2 + \log_4(3+x)$

$$1 = \log_4 2(3+x)$$

$$4^1 = 2(3+x)$$

$$4 = 6 + 2x$$

$$-2 = 2x$$

$$-1 = x$$

5. $\log_3(x^2 + 6) = \log_3 5x$

$$x^2 + 6 = 5x$$

$$x^2 - 5x + 6 = 0$$

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

$$x = 3 \quad x = 2$$

10. $\log(t+3) + \log(t) = 1$

$$\log t(t+3) = 1$$

$$10^1 = t(t+3)$$

$$10 = t^2 + 3t$$

$$0 = t^2 + 3t - 10$$

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

$$t = -5$$

$$t = 2$$

11. $\log_2(t+1) + \log_2(t-1) = 5$

$$\log_2(t+1)(t-1) = 5$$

$$t^2 - 1 = 5$$

$$t^2 = 6$$

$$\boxed{t = \sqrt{6}}$$

12. $-2 = \log(2) - \log(3+x)$

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

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

$$\frac{1}{100} = \frac{2}{3+x}$$

Cross multiply

$$3+x = 200$$

$$\boxed{x = 197}$$

13. $\log(3t) = \log(5t-2)$

$$3t = 5t - 2$$

$$2 = 2t$$

$$\boxed{1 = t}$$

14. $\log_2 6 - \log_2 3 = x$

$$\log_2 \frac{6}{3} = x$$

$$\log_2 2 = x$$

$$\boxed{1 = x}$$

15. $\log_3(4t) = 1 - \log_3(3t)$

$$\log_3(4t) + \log_3(3t) = 1$$

$$\log_3(12t^2) = 1$$

$$3^1 = 12t^2$$

$$.25 = t^2$$

$$\boxed{t = .5}$$

16. $\log_2(-x) = 3 - \log_2(2-x)$

$$\log_2(-x) + \log_2(2-x) = 3$$

$$\log_2(-x)(2-x) = 3$$

$$2^3 = -2x + x^2$$

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

$$0 = (x-4)(x+2)$$

$$\boxed{x = 4}$$

$$\boxed{x = -2}$$

17. $7^x = 49$

$$7^x = 7^2$$

$$\boxed{x = 2}$$

18. $\log_5 8x = \log_5(7x-3)$

$$8x = 7x - 3$$

$$\boxed{x = -3}$$