Name: Answers Date: _____

Homework: Exponential and Logarithmic Equations (Day 2) **Honors PreCalculus**

Textbook Pages 315-316 *Problems 11, 15, 17, 19, 28, 29, 31, 39, 50*

11) $\frac{1}{2}\log_3 x = 2\log_3 2$

$\log_3 \sqrt{x} = \log_3 2^2$

$\sqrt{x} = 2^2$

$\sqrt{x} = 4$

$\boxed{x = 16}$

15) $3\log_2(x-1) + \log_2 4 = 5$

$\log_2 4(x-1)^3 = 5$

$2^5 = 4(x-1)^3$

$32 = 4(x-1)^3$

$\sqrt[3]{8} = \sqrt[3]{(x-1)^3}$

$2 = x-1$

$\boxed{3 = x}$

17) $\log x + \log(x+15) = 2$

$\log(x(x+15)) = 2$

$10^2 = x(x+15)$

$100 = x^2+15x$

$0 = x^2+15x-100$

$0 = (x-5)(x+20)$

$x = 5$ ✓

$x = -20$ ✗

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

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

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

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

$10x-20 = 2x+1$

$8x-20 = 1$

$8x = 21$

$\boxed{x = \frac{21}{8}}$

28) $\log_2(x+1) + \log_2(x+7) = 3$

$\log_2(x+1)(x+7) = 3$

$2^3 = (x+1)(x+7)$

$9 = x^2+8x+7$

$0 = x^2+8x-1$

$x = \frac{-8 \pm \sqrt{8^2-4(1)(-1)}}{2(1)}$

$x = \frac{-8 \pm \sqrt{68}}{2}$

$\boxed{x = .123}$ ✓ $x = -8.123$ ✗

29) $\log_{\frac{1}{3}}(x^2+x) - \log_{\frac{1}{3}}(x^2-x) = -1$

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

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

$\left(\frac{1}{3}\right)^{-1} = \frac{x+1}{x-1} \rightarrow 3 = \frac{x+1}{x-1} \cdot x-1$

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

$3x-3 = x+1$

$2x-3 = 1$

$2x = 4$

$\boxed{x = 2}$

31, 39, 50 on back ⟶

1. $\log_{5-x}(x^2-2x+65) = 2$

$(5-x)^2 = x^2-2x+65$

$25-10x+x^2 = x^2-2x+65$

$-x^2 \quad -x^2$

$25-10x = -2x+65$

$25 = 8x+65$

$-40 = 8x$

$\boxed{-5 = x}$ ✓

2. $\frac{\log(35-x^3)}{\log(5-x)} = 3$

$\log(35-x^3) = 3\log(5-x)$

$\log(35-x^3) = \log(5-x)^3$

$(35-x^3) = (5-x)^3$

$35-x^3 = (5-x)(5-x)(5-x)$

$35-x^3 = (25-10x+x^2)(5-x)$

$35-x^3 = 125-25x-50x+10x^2+5x^2-x^3$

$0 = 15x^2-75x+90$

$15(x^2-5x+6) = 0$

$15(x-3)(x-2) = 0$

$\boxed{x = 3 \quad x = 2}$

31) $\log_a(x-1) - \log_a(x+6) = \log_a(x-2) - \log_a(x+3)$

$$\log_a \frac{x-1}{x+6} = \log_a \frac{x-2}{x+3}$$

$$(x+6)(x+3) \cdot \frac{x-1}{x+6} = \frac{x-2}{x+3} \cdot (x+3)(x+6)$$

$$(x+3)(x-1) = (x-2)(x+6)$$

$$x^2 + 2x - 3 = x^2 + 4x - 12$$

$$-x^2 \qquad -x^2$$

$$2x - 3 = 4x - 12$$

$$-2x \qquad -2x$$

$$-3 = 2x - 12$$

$$9 = 2x$$

$$\boxed{\frac{9}{2} = x}$$

39) $5(2^{3x}) = 8$

$$2^{3x} = \frac{8}{5}$$

$$\log_2 \frac{8}{5} = 3x$$

$$.678 = 3x$$

$$\boxed{.226 = x}$$

50) $3^{2x} + 3^x - 2 = 0$

$$a = 3^x$$

$$a^2 + a - 2 = 0$$

$$(a+2)(a-1) = 0$$

$$(3^x + 2)(3^x - 1) = 0$$

$3^x + 2 = 0$ $\quad$ $3^x - 1 = 0$

$3^x = -2$ $\quad$ $3^x = 1$

$\log_3(-2) = x$ $\quad$ $\boxed{x = 0}$

↑ x

can't be negative