Name: _____ Date: _____

Learning Goal 8.1	Solving exponential and logarithmic equations with same base and with different bases, including base e.

Power Law	**Product Law**	**Quotient Law**	**Change of Base**
$\log_b x^c = c\log_b x$	$\log_b(xy) = \log_b x + \log_b y$	$\log_b\left(\frac{x}{y}\right) = \log_b x - \log_b y$	$\log_b x = \frac{\log_a x}{\log_a b}$

Example Estimate the value of $\log_3 50$, then evaluate it (round to the nearest hundredth).

$\Leftrightarrow 3^x = 50$

$x \doteq 3.3$, 3.4, 3.2

$3, 9, 27, 81$ $\quad 27 < 50 < 81$

hundredth tenth

Example Solve for x. State any restrictions on the variable and verify your answers.

a. $\log_2 x = \log_2 18 - \log_2 6$

$x > 0$

$\log_2 x = \log_2\left(\frac{18}{6}\right)$

$\log_2 x = \log_2 3$

$x = 3$

is $3 > 0$

b. $\log_5(x-3) + \log_5 x = \log_5 10$

$x - 3 > 0$ $\quad x > 0$

$x > 3$

$\log_5(x(x-3)) = \log_5 10$

$x(x-3) = 10$

$x^2 - 3x = 10$

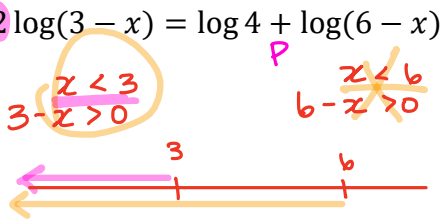
$x^2 - 3x - 10 = 0$ $\quad -5 \times 2 = -10$, $-5 + 2 = -3$

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

$x = 5$ $\quad x = -2$ too small extraneous.

Assignment p. 412 # 1, 3 – 6, 9, 10, 12, 18 – 21, C1, C4 Quiz Next Day!

c. $2\log(3-x) = \log 4 + \log(6-x)$



$\log(3-x)^2 = \log(4(6-x))$

$(3-x)^2 = 4(6-x)$

$x^2 - 6x + 9 = 24 - 4x$

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

$-5 \times 3 = -15$

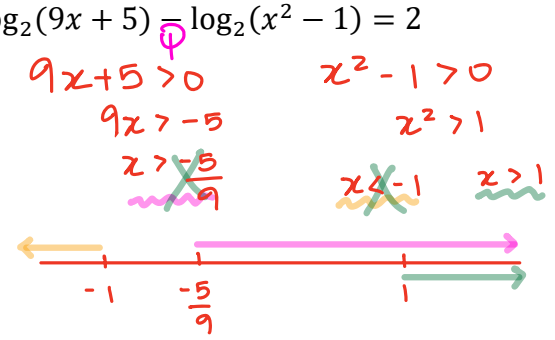
$-5 + 3 = -2$

$(x-5)(x+3) = 0$

extraneous $x = 5$

$x = -3$

d. $\log_2(9x+5) - \log_2(x^2-1) = 2$



$2\log_2\left(\frac{9x+5}{x^2-1}\right) = 2^2$ ($\log_2 4$)

$(x^2-1) \times \frac{9x+5}{x^2-1} = 4 \times (x^2-1)$

$9x + 5 = 4x^2 - 4$

$0 = 4x^2 - 9x - 9$

$-12 \times 3 = -36 = 4 \times -9$

$-12 + 3 = -9$

$0 = 4x^2 - 12x + 3x - 9$

$= 4x(x-3) + 3(x-3)$

$= (x-3)(4x+3)$

$x = 3$

$x = -\frac{3}{4}$ extraneous!