8.3 Solving Logarithmic Equations

Old Rewriting Exponentials into Logs

① $\log_6 36 = 2$

$6^2 = 36$

② $\log_{289} 17 = \frac{1}{2}$

$289^{\frac{1}{2}} = 17$

③ $12^2 = 144$

$\log_{12} 144 = 2$

④ $9^{-2} = \frac{1}{81}$

$\log_9 \frac{1}{81} = -2.$

⑤ $8^b = a$

$\log_8 a = b$

Find the unknown.

⑥ $64^x = 8$

$\log_{64} 8 = x$

$x = \frac{\log 8}{\log 64} = \frac{1}{2}$

⑦ $4^x = 256$

$\log_4 256 = x$

$x = \frac{\log 256}{\log 4} = 4.$

⑧ $64^x = 4$

$\log_{64} 4 = x$

$x = \frac{\log 4}{\log 64} = \frac{1}{3}$

⑨ $\log_2 x = 5$

$2^5 = x$

$32 = x.$

⑩ $\log_6 x = 3$

$6^3 = x$

$216 = x$

⑪ $\log_{19} x = -2$

$19^{-2} = x$

$\frac{1}{361} = x$

[new] Solving Logs/Exponential Functions

1. isolate the log term or exponential term.
2. use "BOB" or use the inverse to get unknown alone.
3. Solve using appropriate technique.

[Examples] Solve the equation.

① $5^x - 21 = 14$

$5^x = 35$

$\log_5 35 = x$

$x \approx 2.209$

② $2(3)^{2x} - 5 = 117$

$2(3)^{2x} = 122$

$(3)^{2x} = 61$

$\log_3 61 = 2x$

$\frac{\log_3 61}{2} = x$

③ $\log_2 4x = 5$

$2^5 = 4x$

$\frac{2^5}{4} = x$

$8 = x$

④ $\log_6(5x+11) + 5 = 8$

$\log_6(5x+11) = 3$

$6^3 = 5x+11$

$216 = 5x+11$

$205 = 5x$

$41 = x.$

⑤ $3(4^{x-4}) - 8 = 106$

$3(4^{x-4}) = 114$

$4^{x-4} = 38$

$\log_4 38 = x-4$

$\log_4 38 + 4 = x$

$6.624 \approx x$