Learning Goal(s):

1.8.1: Solving Exponential Equations Using Logarithms

Date: ____________________

Laws of Logarithms for Powers $\log_a x^n = n\log_a x \quad [x > 0, a > 0, a \neq 1]$

Ex. 1 $\quad \log 8 = 0.903$ and

$$\begin{aligned} &\log 8 \\ &= \log 2^3 \\ &= 3\log 2 \\ &= 3(0.301) \\ &= 0.903 \end{aligned}$$

New: To solve an exponential equation, take the logarithm of each side.

Ex. 2 Solve each equation to 3 decimal places.

a) $2^x = 55$

Method 1

Method 2

b) $5^x = 20$

c) $3^{2x+1} = 14$

Law of Logarithms for Multiplication

$\log_a xy = \log_a x + \log_a y \quad [x>0, y>0, a>0, a\neq 1]$

Law of Logarithms for Division

$\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y \quad [x>0, y>0, a>0, a\neq 1]$

Ex. 3 [from 1.4.1 Ex. 2b] Suppose you invest \$1000 at 8% per year, compounded *quarterly*.

b) Estimate how many years it takes for the investment to grow to \$2800.

$2800 = 1000(1.02)^{4x}$

Method 1

Method 2

p.344 #9 and Worksheet 1.8.2