9 Sec 10.6 (cont.) 12/4/12 Math 1010

6

#6 $5^{0.3x} = 11$

$\log 5^{0.3x} = \log 11$

$\frac{0.3x \log 5}{0.3 \log 5} = \frac{\log 11}{0.3 \log 5}$

$x = \frac{\log 11}{(0.3 \log 5)}$

$= 4.966320341$

4.966

$\frac{0.3x}{0.3} = \frac{\log 11}{\log 5} / 0.3$

9

$$2^{x+3} = 3^{x-4}$$

$$\log 2^{(x+3)} = \log 3^{(x-4)}$$

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

$$(x+3)6 = (x-4)10$$

$$6x + 3\cdot 6 = 10x - 4\cdot 10$$

$$\begin{array}{r} 6x \\ -10x \\ \hline -4x \end{array} \qquad \begin{array}{r} 10x \\ -10x \end{array}$$

$$x\log 2 + 3\log 2 = x\log 3 - 4\log 3$$

$$\begin{array}{r} -x\log 3 \\ -3\log 2 \end{array} \qquad \begin{array}{r} -x\log 3 \\ -3\log 2 \end{array}$$

$$x\log 2 - x\log 3 = -4\log 3 - 3\log 2$$

$$\frac{x(\log 2 - \log 3)}{\log 2 - \log 3} = \frac{-4\log 3 - 3\log 2}{\log 2 - \log 3}$$

$$x = \frac{-4\log 3 - 3\log 2}{\log 2 - \log 3} = 15.966579104$$

$$\boxed{15.967}$$

Solving Equations with Logs

Ex: $\log_{[2]}(x+5) = 4$ → Exponentiate with base 2

$2^{\log_2(x+5)} = 2^4$

$x+5 = 2^4$

$x+5 = 16$

$-5 \quad -5$

$x = 11$

1st $x = y$

2nd $a^x = a^y$ } EXP

$a^{\log_a x} = x$

Ex: $\log x + \log(x-21) = 2$

Product Rule ↓

$\log_{10}[x(x-21)] = 2$

$10^{\log_{10}[x(x-21)]} = 10^2$

$x(x-21) = 100$

$x^2 - 21x = 100$

-100

$x^2 - 21x - 100 = 0$

$(x-25)(x+4) = 0$

$x-25=0 \quad x+4=0$

$\boxed{x=25}$ ~~$x=-4$~~

How to Solve Log problems

1. Transform the Equation so only one Log appears on one side of the Equation
2. Exponentiate both sides ($a^x = a^y$) using the same base as the Log
3. Apply Inverse property to cancel the Log ($a^{\log_a x} = x$)
4. Finish solving for x
5. Check each solution in the original form of the Equation

#41 $\log_2 x + \log_2 (x-7) = 3$

$\log_2 [x(x-7)] = 3$ $\quad -1(-8)$

$2^{\log_2 [x(x-7)]} = 2^3$

$x(x-7) = 8$

$x^2 - 7x = 8$

$x^2 - 7x - 8 = 0$

$(x-8)(x+1) = 0$

$x-8=0 \qquad x+1=0$

$\boxed{x=8}, \cancel{-1}$

#35 $\log(6x+1) = \log 3$

Recall $\log_a x = \log_a y$

$x = y$

$10^{\log(6x+1)} = 10^{\log 3}$

$6x+1 = 3$

$-1 \quad -1$

$\frac{6x}{6} = \frac{2}{6} \qquad x = \frac{1}{3}$

Simple Interest: $I = pr$

Compound Interest

Compound multiple times per year

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

A = Amount of money at the end

P = Principal (amount Invested)

r = Rate (in decimal form)

n = how many times compounded per year

t = how many years

Compound continuously

$$A = Pe^{rt}$$

A = Total amount at end

P = Principal

r = Rate

t = # of years

Recall

$e \approx 2.718$

ask your calculator