10.4 48, 30 . 12/3/12 - Sec 10.6 cont. Math 1010

10.5

#42

10.4

#30

$$\log_{10}(x+4) + \log_{10}(x-4)$$

$$\log_{10}\left[(x+4)(x-4)\right]$$

$$\log_{10}(x^2 + \cancel{4x - 4x} - 16)$$

$$\log_{10}(x^2 - 16)$$

#48

$$\log_3 49 + \log_3 49^{-1} = 0$$

way 1

$$\log_3(49 \cdot 49^{-1}) = 0$$

$$\log_3\left(49 \cdot \frac{1}{49}\right)$$

$$\log_3 1$$

$$0 = 0 \checkmark$$

way 2

$$\log_3 49 + -1 \log_3 49$$

$$\log_3 49 - \log_3 49$$

$$0 = 0 \checkmark$$

$\log_2(8+8)$ vs $\log_2 8 + \log_2 8$

$\log_2 16 = ?$

$2^? = 16$

$\log_2 16 = 4$

$\log_2 8 = ?$

$2^? = 8$

$3 + 3$

6

$\log_2(8+8)$ change to $\log_2(8 \cdot 8)$

10.5

42

24

39

56

#24 $\log e$

$\log_{10} e^1 = 0.4343$

[log] [e^x] [1] [=] 0.4343

#39

Spinich 5.4

$$pH = -\log[\text{hydronium ion concentration}]$$

$$\frac{5.4}{-1} = \frac{-\log X}{-1}$$

$$-5.4 = \log_{10} X$$

$$10^{-5.4} = X$$

$$X = 0.0000039781$$

$$\boxed{3.981 \times 10^{-6}}$$

#42

$$t(r) = \frac{\ln 2}{\ln(1+r)}$$

a) $2\%\ (.02) \leftarrow r$

$$t = \frac{\ln 2}{\ln(1+.02)} = \frac{\ln 2}{\ln 1.02}$$

$$= 35.0 \text{ yrs}$$

b) 5% $r = 0.05$

$$t = \frac{\ln 2}{\ln(1+.05)} = \frac{\ln 2}{\ln 1.05} = 33$$

14.2

ln (2) / ln 1.05

$$\ln\left(\frac{2}{\ln 1.05}\right)$$

#56 $\log_{\pi} 10 = \frac{\log 10}{\log \pi} = \frac{1}{\log \pi} =$ 2.0115

$$\log_a X = \frac{\log_b X}{\log_b a}$$

$$= \frac{\ln 10}{\ln \pi} =$$ 2.0115

Sec 10.6 Exponential Equations
Logarithmic Equations

Properties to Remember

1. If $x = y$ then $a^x = a^y$ ← Exponentiating

2. If $a^x = a^y$ then $x = y$

3. If $x = y$ then
$\log_a x = \log_a y$ ← taking the log of both sides

4. if $\log_a x = \log_a y$
then $x = y$

Inverse Properties

$a^{\log_a x} = x$ and $\log_a a^x = x$

$\sqrt[3]{x^3} = x$

$= x$

Review Log Properties

Product: $\log_a(xy) = \log_a x + \log_a y$

Quotient: $\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y$

Power: $\log_a x^r = r \log_a x$

Solving Exponential Eq

$3^x = 81 \Rightarrow 3^x = 3^4 \Rightarrow x = 4$

$3^x = 12$ take the log of both sides

$\log 3^{\boxed{x}} = \log 12$

$x \log 3 = \log 12$

$\frac{x \log 3}{\log 3} = \frac{\log 12}{\log 3}$

$x \cdot 4 = 5$

$x = \frac{\log 12}{\log 3}$

$\approx \boxed{2.2619}$

$3^x = 12$

$3^{2.2619} \overset{?}{=} 12$ ✓

$$3^x = 81$$

$$\ln 3^x = \ln 81$$

$$\frac{x \ln 3}{\ln 3} = \frac{\ln 81}{\ln 3}$$

$$x = \frac{\ln 81}{\ln 3}$$

$$= 4$$

Solve $e^{2x} = 15$

$$\log e^{2x} = \log 15$$

$$\frac{2x \log e}{2 \log e} = \frac{\log 15}{2 \log e}$$

$$x = \frac{\log 15}{2 \log e}$$

$$= 1.3540$$

$$x = 1.3540$$

$$= \ln e^{2x} = \ln 15$$

$$2x \boxed{\ln e} = \ln 15$$

$$2x = \ln 15$$

$$x = \frac{\ln 15}{2}$$