$\log_b b^r = r$

$b^{\log_b M} = M$

③ $e^{\ln_e(2)} = 2$

⑮ $18\log x + 9\log y - \log 10$

$\log x^{18} + \log y^9 - \log 10$

$\log\left(\frac{x^{18}y^9}{10}\right)$

9-3 Solving Exponential and Logarithmic equations

Objectives:

I can solve exponential and logarithmic equations both graphically and algebraically.

Solving Graphically

$275e^{0.06x} = 1000$

$y_1 = 275e^{.06x}$ $y_2 = 1000$

$X = 21.52$

window
1100
10 30
900

$10^{2x} = 1500$

$y_1 = 10^{2x}$ $y_2 = 1500$

$X = 1.59$

Inverses

Addition/Subtraction	Natural Log/e^	Common Log/10^	Log base b/b^
$x-5=10$ $+5 \quad +5$ $x=15$	$e^x = 5$ $\ln(e^x) = \ln(5)$ $x = \ln(5)$	$10^x = 100$ $\log(10^x) = \log(100)$ $x = \log(100)$	$2^x = 16$ $\log_2(2^x) = \log_2(16)$ $x = \log_2 16$
$x+7=21$ $-7 \quad -7$ $x=14$	$\ln x = 7$ $e^{\ln x} = e^7$ $x = e^7$	$\log x = 3$ $10^{\log x} = 10^3$ $x = 10^3$	$\log_3 x = 4$ $3^{\log_3 x} = 3^4$ $x = 3^4$

Solve the following equations

$10 = 5e^{4x}$

$\frac{10}{5} = \frac{5e^{4x}}{5}$

$\ln(2) = \ln(e^{4x})$

$\frac{\ln(2)}{4} = \frac{4x}{4} = 0.17$

$5^{x-1} - 4 = 7$

$+4 \quad +4$

$\log_5(5^{x-1}) = \log_5(11)$

$x - 1 = \log_5(11)$

$+1 \quad +1$

$x = \log_5(11) + 1 = 2.49$

$\frac{\log(11)}{\log(5)} + 1$

$\log_3(2x-4) = 4$

$3 \quad 3$

$2x - 4 = 3^4$

$2x - 4 = 81$

$+4 \quad +4$

$\frac{2x}{2} = \frac{85}{2}$

$x = 42.5$

$6^{3x} = 12$

$\log_6(6^{3x}) = \log_6(12)$

$\frac{3x}{3} = \frac{\log_6(12)}{3}$

$\frac{\log(12)}{\log(6)} / 3 = 0.46$

Solve the following

$\ln(x+12) = 3\ln 2$

$\ln(x+12) = \ln(2^3)$

$e^{\ln(x+12)} = e^{\ln(8)}$

$x + 12 = 8$

$-12 \quad -12$

$x = -4$

$\log x^4 = 2$

$4 \cdot \log x = 2$

$\frac{4 \log x}{4} = \frac{2}{4}$

$\log x = 0.5$

$x = 10^{0.5}$

$\log x^4 = 2$

$\sqrt[4]{x^4} = \sqrt[4]{100}$

$4\ln(x+7) - 5 = 1$

$+5 \quad +5$

$\frac{4\ln(x+7)}{4} = \frac{6}{4}$

$\ln(x+7) = 1.5$

$e^{\ln(x+7)} = e^{1.5}$

$x + 7 = e^{1.5}$

$-7 \quad -7$

$x = e^{1.5} - 7$

$= -2.52$

Solve the following

$$\log(x+2)-3=5$$

$$\log_4(1-x)=1$$

Suppose that $250 is deposited into an account that pays 4.5% compounded quarterly. Solve to find how long it will take for the account to contain at least $500.

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

$$500=250\left(1+\frac{.045}{4}\right)^{4t}$$

$$\frac{500}{250}=\frac{250(1.01125)^{4t}}{250}$$

$$\log_{1.01125} 2=\frac{\log(1.01125)^{4t}}{\log 1.01125}$$

How long will it take for a $250 initial investment in an account that pays 4.5% compounded continuously to grow to $750?

Comparing acidity: $pH = -\log\left[H^+\right]$

$\left[H^+\right]$ = hydrogen-ion concentration

Vinegar has a pH of 2.4. What is it's hydrogen ion concentration?

Baking soda has a pH of 8.4. What is it's hydrogen ion concentration?

Which has a higher hydrogen ion concentration?