7-3 Solving Exponential and Logarithmic equations

Objectives:

- I can solve exponential and logarithmic equations

Solving Graphically

$$275e^{0.06x} = 1000$$

y_2

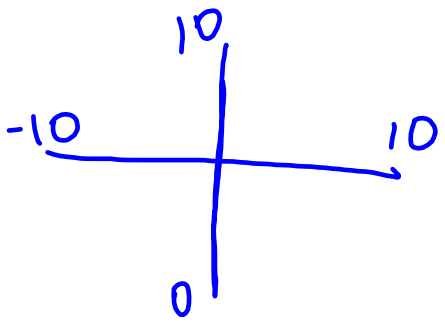
$y_1 = 275e^{.06x}$ $\quad y_2 = 1000$

$x = 21.5$

Solve the following equation graphically

$$5e^x = 8$$

$y_1 = 5e^x$ $\quad$ $y_2 = 8$



$x = 0.47$

Solving Equations Algebraically

- get logarithm/exponent by itself
- re-write in logarithmic/exponential form
- use the property of equality
- use the inverse property
- use properties to condense to one logarithm

Solve the following equations

$10 = 5e^{4x}$

$\frac{10}{5} = \frac{5e^{4x}}{5}$ ← exponent (get alone)

$2 = e^{4x}$

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

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

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

$5^x - 4 = 7$

$+4 \quad +4$

$\log_5(5^x) = \log_5(11)$

$x = \log_5(11) =$

$= \frac{\log(11)}{\log(5)} = 1.49$

Solve the following equations

$2e^{x-1} + 5 = 80$

$-5 \quad -5$

$\frac{2e^{x-1}}{2} = \frac{75}{2}$

$\ln(e^{x-1}) = \ln(37.5)$

$x - 1 = \ln(37.5)$

$+1 \quad +1$

$x = \ln(37.5) + 1 =$

$x = 4.62$

$6^{3x} = 12$

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

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

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

$x = 0.46$

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

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

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

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

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

$t = \frac{\log_{1.01125}(2)}{4} = 15.5 \text{ yrs}$

Suppose that you deposit $2500 into an account that earns a 4.5% interest rate. How long will it take to reach $4200.

Solve the following

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

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

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

$x + 12 = 8$

$-12 \quad -12$

$x = -4$

Solve the following

$$\log(x^4) = 2$$

$10^{\log(x^4)} = 10^2$

$x^4 = 10^2$

$\sqrt[4]{x^4} = \sqrt[4]{100} = 100^{1/4} = 3.16$

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

$+5 \quad +5$

$\frac{4\ln(x+7)}{4} = \frac{6}{4} = \frac{3}{2}$

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

$x + 7 = e^{1.5}$

$-7 \quad -7$

$x = e^{(1.5)} - 7$

$= -2.52$

Solve the following

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

$\log_4(1-x)=1$

① $4e^x = 60$

② $120 = 75e^{3x}$

③ $25e^{2x} = 625$

⑪

—— $x \approx 1.099$

—— $x \approx 0.341$

—— $x \approx 0.366$

—— $x \approx 1.700$