6-2 Solving Exponential and Logarithmic equations

Objectives:

6-2a: I can solve exponential and logarithmic equations graphically.

6-2b: I can solve exponential and logarithmic equations algebraically.

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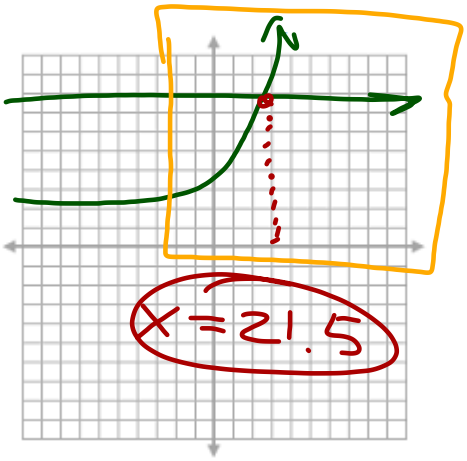
Solving Graphically

Graph each side of the equation as their own graphs and find the intersection.

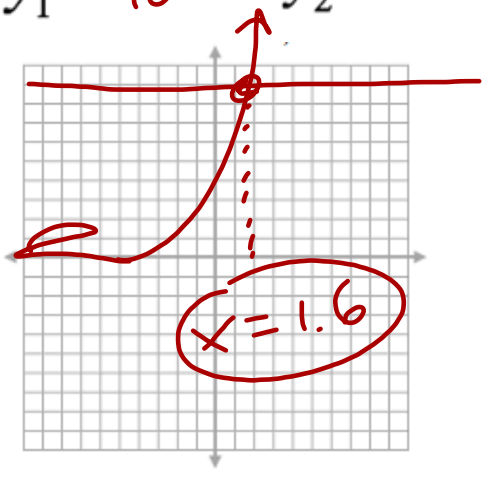
$275e^{0.06x} = 1000$

$y_1 = 275e^{0.06x}$ $y_2 = 1000$



$10^{2x} = 1500$

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



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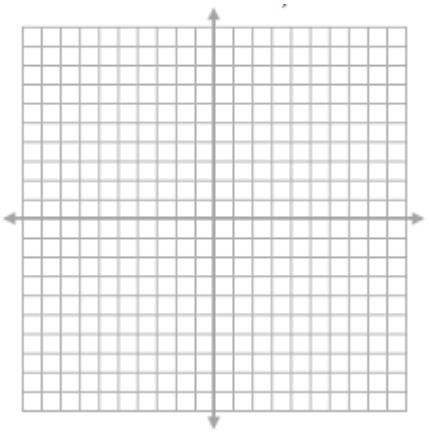
Now you try...solve the exponential & logarithmic equations graphically.

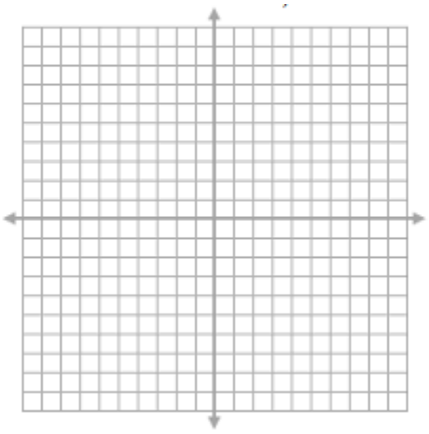
$20^{2r} = 56$

$y_1 =$ $y_2 =$



$e^{.23x} = 1.99$

$y_1 =$ $y_2 =$



Logarithmic equations are the inverse of Exponential equations

Exponential Equation	Logarithmic Equation
$b^x = a$	$\log_b a = x$

$$b > 0, b \neq 1$$

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Inverses

Addition/Subtraction	Natural Log/e^	Common Log/10^	Log base b/b^
$x-5=10$	$\ln e^x = 5$ $x = \ln 5$	$10^x = 100$ $x = 2$	$\log_2 2^x = 16$ $x = 4$
$x+7=21$	$\ln x = 7$ $x = e^7$	$\log x = 3$ $x = 1000$	$\log_3 x = 4$ $x = 81$

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Solve the following equations

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

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

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

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

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

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

$x - 1 = \log_5 11$

$+1 \quad +1$

$x = \log_5(11) + 1$

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

$2x - 4 = 81$

$x = 42.5$

$\log_6 6^{3x} = \log_6 36$

$3x = 2$

$x = \frac{2}{3}$

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Solve the following

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

$x=-4$

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

$x+12=8$

$\log_{10}(4x)=2$

$\frac{4x}{4}=\frac{100}{4}$ $x=25$

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

$+5\ +5$

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

$e^{\ln(x+7)}=e^{\frac{3}{2}}$

$x+7=e^{3/2}$

$-7\quad -7$

$x=e^{3/2}-7$

or

$x=\sqrt{e^3}-7$

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Day 2

Solve the following

$\log_6 x+\log_6(x+1)=2$

$6^{\log_6 x(x+1)}=6^2$

$x(x+1)=36$

$x^2+x=36$

$x^2+x-36=0$

$x=\frac{-1\pm\sqrt{1^2-4(1)(-36)}}{2(1)}$

$x=\frac{-1\pm\sqrt{145}}{2}$

$\log_5(x^2+1)-\log_5 10=1$

$5^{\log_5\frac{x^2+1}{10}}=5^1$

$10\cdot\frac{x^2+1}{10}=5\cdot 10$

$x^2+1=50$

$x^2=49$

$x=7,-7$

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Solve the following

$2^{x+1} \cdot 2^{x+3} = 1$

$\log_2 2^{2x+4} \quad \log_2 1$

$2x+4=0$

$x=-2$

$3^{x} \cdot 3^{x-4} = 27$

Solve the following

$\frac{2^{2x+5}}{2^{x+7}} + 4 = 20$

$2^{x-2} + 4 = 20$

$\log_2 2^{x-2} \quad \log_2 16$

$x-2=4$

$x=6$

$\log_3 \sqrt{2x+6} = \log_3 x + \log_3 2$

$\log_3 \sqrt{2x+6} = \log_3 2x$

$(\sqrt{2x+6})^2 = (2x)^2$

$2x+6 = 4x^2$

$4x^2 - 2x - 6 = 0$

Factor $\rightarrow$ $2(2x-3)(x+1)=0$

-24, -6, 4

$2x-3=0$ $\quad x+1=0$

$x=\frac{3}{2}$ $\quad x=-1$