

Solving Exponential Equations by Graphing

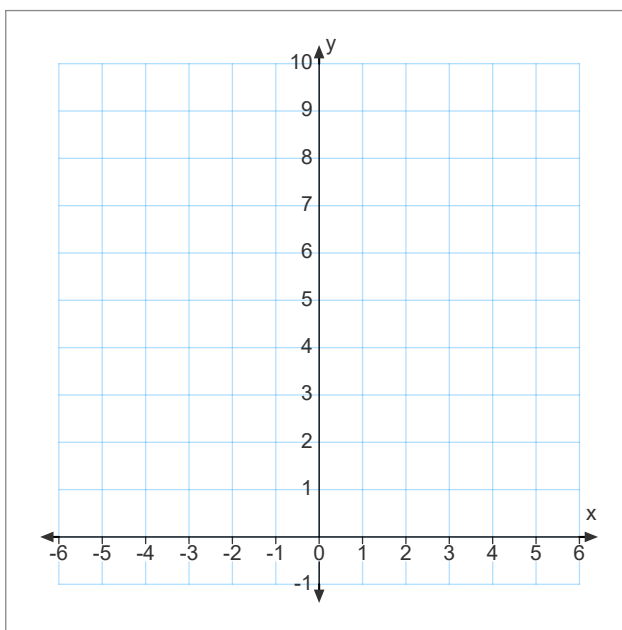
Learning Goal: By the end of today I will be able to solve exponential equations using graphing technology.

Sep 8-1:36 PM

Graph the following on the same axis:

$$y = 4$$

$$y = 2^x$$



What is the x value of the point of intersection?

Sep 8-1:38 PM

Solve

$$2^x = 4$$

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Solve

$$2^x = 8$$

Solve

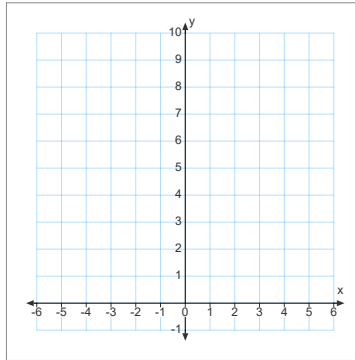
$$2^x = 5$$

Sep 8-1:52 PM

Graph the following on the same axis:

$$y = 5$$

$$y = 2^x$$



What is the x value of the point of intersection?

Sep 8-1:38 PM

SOLVING EXPONENTIAL EQUATIONS

METHOD ONE

➡ must be of the form: one term = one term

$$2^{x-10} = 4^{3x}$$

➡ rewrite the powers with the same bases

$$2^{x-10} = (2^2)^{3x}$$

$$2^{x-10} = 2^{6x}$$

➡ the exponents become equal

$$x - 10 = 6x$$

➡ equating the exponents gives an equation that can be solved

$$x - 10 = 6x$$

$$-10 = 5x$$

$$-2 = x$$

➡ In general, If $a^x = a^y$, then $x = y$ for $a \neq 1, 0, -1$

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Method One - Samples

$2^x = 16$	$2^{x+3} = 2^{-x-1}$	$2^{x+3} = 4^{x-1}$
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SOLVING EXPONENTIAL EQUATIONS

METHOD TWO

- ➔
 more than two terms in the equation
(added or subtracted terms is a hint to try this)
- ➔
 can solve by first removing a power as a common factor

$$3^{x+2} + 3^{x+1} = 108$$

$$(3^x)(3^2) + (3^x)(3^1) = 108$$

$$(3^x)[(3^2) + (3^1)] = 108$$

$$(3^x)[12] = 108$$
- ➔
 after factoring, divide both sides by remaining multiple

$$(3^x) = \frac{108}{12}$$

$$(3^x) = 9$$
- ➔
 proceed with steps from method one

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Method Two - Samples

$27^{x-1} = 9^{2x}$	$3^{x-1} = 1$
← change each term to a base of 3	
$3^{3x-3} = 3^{4x}$ $3^{3x-(4x-2)} = 3^{x+4}$ 125 $3^{-x+2} = 3^{x+4}$ $-2x = 2$ $x = -1$	$\frac{27^x}{9^{2x-1}} = 3^{x+4}$ <small>subtract exponents</small>

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Method Two - Samples

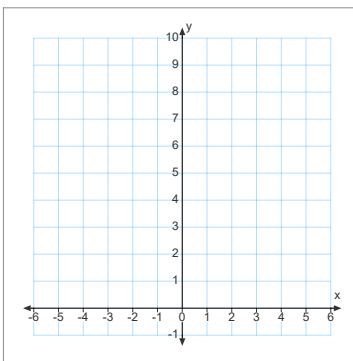
$2^{x+2} - 2^x = 48$	$10^{t+4} + 10^{t+3} = 11$
$2^x(2^2-1) = 48$ $2^x(3) = 48$ <small>divide by 3</small> $2^x = 16$ $2^x = 2^4$ $x = 4$	$10^{t+3}(10^1+1) = 11$ $10^{t+3}(11) = 11$ <small>divide by 11</small> $10^{t+3} = 1$ $10^{t+1} = 10^0$ $t + 3 = 0$ $t = -3$

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Solve the following by graphing: $2^{x+1} = 4^{2x}$

$$y = 2^{x+1}$$

$$y = 4^{2x}$$



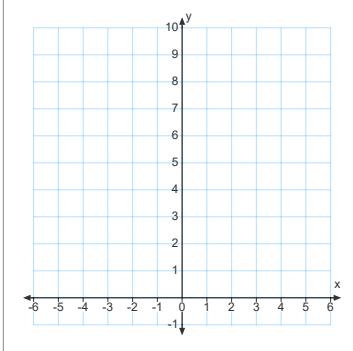
What is the x value of the point of intersection?

Sep 8-1:38 PM

Solve the following by graphing: $8^{-3x+2} = 4^{2x-5}$

$$y = 8^{-3x+2}$$

$$y = 4^{2x-5}$$



What is the x value of the point of intersection?

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Homework - See handout 1-6

Sep 8-7:46 PM