

## Solving Exponential Equations

- Take a logarithm

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Example: **Solve  $4^x = 11$**

Always take the log of the number that is being raised to the power. Like  $4^x$

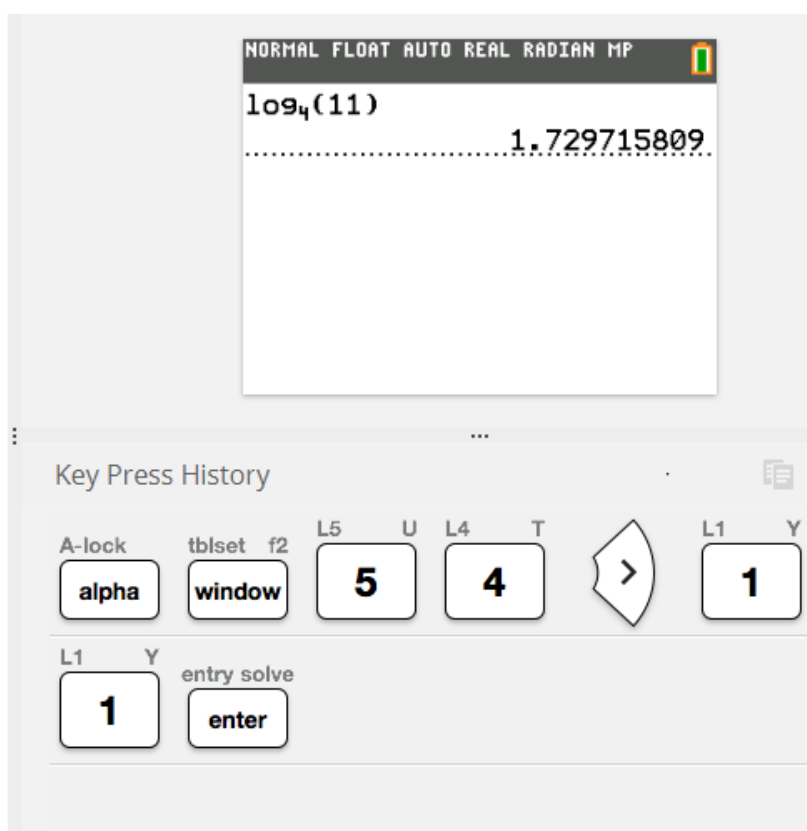
$$\log_4 4^x = \log_4 11$$

$$\log_4 4^x = x \quad \text{Use calculator to solve}$$

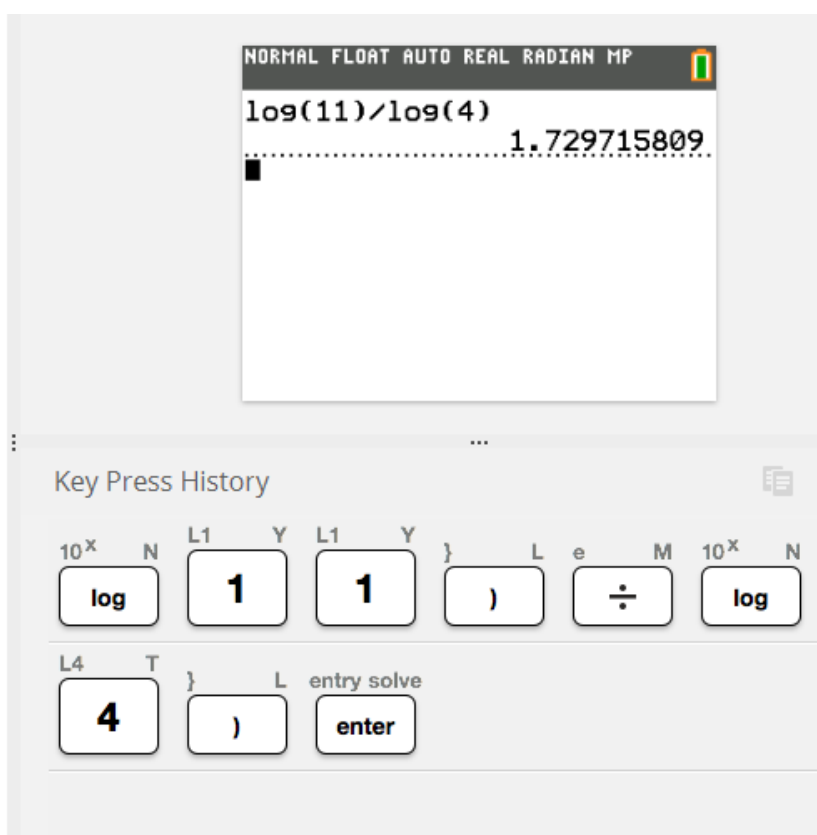
$$x=1.730$$

[How to use calculator is on next page](#)

# Newer Calculator



# Older Calculator



Try these:

$$7^{9x} = 15$$

Do the same method. Find the log on each side.

$$\log_7 7^{9x} = \log_7 15$$

$$\log_7 7^{9x} = 9x$$

$$9x = 1.392$$

Solve for x

$$\frac{9x}{9} = \frac{1.392}{9}$$

$$x = 0.155$$

Always isolate what is being raised to the power first.

$$4e^{-0.3x} - 7 = 13$$

Add 7 to each side

$$4e^{-0.3x} = 20$$

Divide by 4

$$e^{-0.3x} = 5$$

Take natural log on each side

$$\ln e^{-0.3x} = \ln 5$$

$$-0.3x = 1.609$$

Divide by -0.3 on each side

$$x = -5.365$$

$$4 \cdot 2^{b+8} = 33$$

get  $2^b$  by itself

$$2^{b+8} = \frac{33}{4} \quad \text{Divide by 4 on each side}$$

$$2^{b+8} = 8.25$$

$$\log_2 2^{b+8} = \log_2 8.25$$

$$b + 8 = 3.044 \quad \text{Take the log}$$

$$b = 3.044 - 8 \quad \text{Solve for b}$$

$$b = -4.956$$

$$13^{n-10} - 5 = 87$$

$$13^{n-10} = 92$$

$$\log_{13} 13^{n-10} = \log_{13} 92$$

$$n - 10 = 1.763$$

$$n = 11.763$$

Class work:

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**SOLVING EXPONENTIAL EQUATIONS** Solve the equation.

12.  $8^x = 20$

13.  $e^{-x} = 5$

14.  $7^{3x} = 18$

15.  $11^{5x} = 33$

16.  $7^{6x} = 12$

17.  $4e^{-2x} = 17$

18.  $10^{3x} + 4 = 9$

19.  $-3e^{2x} + 16 = 5$

20.  $0.5^x - 0.25 = 4$



