

Lesson 46: Solving Exponential Equations

By the end of this lesson you will be able to:

- ~ Solve exponential equations using common bases
- ~ Solve exponential equations using logarithms

Lesson 46: Solving Exponential Equations

Solving Exponential Equations

If bases are equal, then the exponents can be set equal.
This is one way to solve exponential equations.

Property of equality for exponential functions: If $b^x = b^y$, then $x = y$

For example: If $2^x = 2^4$ then, $x = 4$

Solving Using Common Bases

Steps :

1. Find a common base for both sides of the equation.
2. Rewrite each base as a power of the common base.
3. Simplify the exponent expression if necessary.
(Remember: power to a power is multiplied.)
4. Set the exponents equal to each other to make a new equation.
5. Solve the new equation

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Example: Solve for the variable $81 = 27^{m-1}$

Step 1: The common base for 81 and 27 is base _____.

Step 2: Rewrite each base as a power of the common base.

Step 3: Simplify the exponent expression.

Step 4: Set exponents equal to each other.

Step 5: Solve the new equation.

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Example: Solve for the variable $2^{3n-9} = 64$

Step 1: The common base for 2 and 64 is base _____.

Step 2: Rewrite each base as a power of the common base.

Step 3: Simplify the exponent expression.

Step 4: Set exponents equal to each other.

Step 5: Solve the new equation.

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Example: Solve for the variable

$$16^{2n+1} = \frac{1}{32}$$

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Solving Using Logarithms

Steps

1. Isolate the exponential expression, if necessary.
2. Take the \ln of both sides.
3. Move the exponent out in front of the log expression.
(Power property of logarithms.)
4. Divide both sides of the equation by the log. (Except when using $\ln e$.)
5. Continue to solve for x , if necessary.
6. Write answers in exact form (with logs), and also as a decimal approximation (round to 3 places).

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Example: Solve for the variable $8^{x+4} - 4 = 100$

Step 1: Isolate the exponential expression.

Step 2: Take the \ln of both sides.

Step 3: Move the exponent out in front of the log expression.

Step 4: Divide both sides of the equation by the log.

Step 5: Continue to solve for x .

Step 6: Find the decimal value.

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Example: Solve for the variable $7^{2x} = 56$

Step 1: Isolate the exponential expression.

Step 2: Take the \ln of both sides.

Step 3: Move the exponent out in front of the log expression.

Step 4: Divide both sides of the equation by the log.

Step 5: Continue to solve for x .

Step 6: Find the decimal value.

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Example: *Solve for the variable*

$$3e^x - 5 = 22$$

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Example: Solve for the variable

$$6^x = 42$$

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Can you?

- ~ Solve exponential equations using common bases
- ~ Solve exponential equations using logarithms

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~Homework~

Assignment 46
and Test Review 11

* Keep in mind we have a VERY QUICK retake for test 11.
So plan on studying hard!!!