

Solving Exponential Equations

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- We can solve exponential equations using logarithms.
- By converting to a logarithm, we can move the variable from the exponent.
- Hint: We want to convert to a logarithm of base 10 or base e .

- Example: Solve $6^{3x} = 81$

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- Solution:

$$\log(6^{3x}) = \log(81)$$

$$3x \cdot \log(6) = \log(81)$$

$$x = \log(81) / 3 \cdot \log(6)$$

$$x \approx 0.8175$$

- Example: Solve $9^{x-4} = 7.13$

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- Solution:

$$\log(9^{x-4}) = \log(7.13)$$

$$x-4 \cdot \log(9) = \log(7.13)$$

$$x-4 = \log(7.13)/\log(9)$$

$$x = \log(7.13)/\log(9) + 4$$

$$x \approx 4.894$$

- Example: Solve $3^{2x-2} = 73^x$

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- Solution:

$$\log(3^{2x-2}) = \log(73^x)$$

$$(2x-2) \cdot \log(3) = x \cdot \log(73)$$

$$2x \cdot \log(3) - 2\log(3) = x \cdot \log(73)$$

$$2x \cdot \log(3) - x \cdot \log(73) = 2\log(3)$$

$$x(2\log(3) - \log(73)) = 2\log(3)$$

$$x = 2\log(3) / (2\log(3) - \log(73))$$

$$x \approx -1.0497$$

- Example: Solve $5^{4x} = 73$

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- Solution:

$$\log(5^{4x}) = \log(73)$$

$$4x \cdot \log(5) = \log(73)$$

$$x = \log(73) / 4 \cdot \log(5)$$

$$x \approx 0.6665$$