

Section 5.4 Guided Notebook

Section 5.4 Exponential and Logarithmic Equations

- Work through Section 5.4 TTK #1
- Work through Section 5.4 TTK #2
- Work through Section 5.4 TTK #3
- Work through Section 5.4 TTK #5
- Work through Section 5.4 TTK #6
- Work through Objective 1
- Work through Objective 2

GET TO KNOW YOUR CALCULATOR!

In this section, it is crucial that you know how to correctly use your scientific calculator. Test yourself by trying the following calculator exercises. If you have trouble getting the answers below, please seek help.

$$1. e^{-0.0035} \approx .9965$$

$$2. \frac{5e^2 - 4}{e^2 - 1} \approx 5.1565$$

$$3. \ln 5 \approx 1.6094$$

$$4. \ln\left(\frac{7}{2}\right) \approx 1.2528$$

$$5. \frac{\ln 3 + \ln 5}{\ln 5} \approx 1.6826$$

$$6. \frac{\ln \pi - 3 \ln 4}{\ln \pi - 2 \ln 4} \approx 1.8516$$

$$7. \frac{\ln\left(\frac{17}{3}\right)}{.00235} \approx 738.1281$$

$$8. \frac{\ln\left(\frac{77}{131}\right)}{\ln\left(\frac{120}{131}\right)} \approx 6.0588$$

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$$9. \frac{\ln 2}{12 \ln \left(1 + \frac{.06}{12} \right)} \approx 11.5813$$

$$10. \frac{-\ln 65}{\left(\frac{\ln \left(\frac{37}{117} \right)}{20} \right)} \approx 72.5188$$

Section 5.4 Exponential and Logarithmic Equations

5.4 Things To Know

1. Solving Exponential Equations by Relating the Bases

Can you solve the two exponential equations below? Work through the **animation** to refresh your memory.

$$a. 8 = \frac{1}{16^x}$$

$$b. \frac{1}{27^x} = \left(\sqrt[4]{3} \right)^{x-2}$$

2. Changing from Exponential to Logarithmic Form

Do you remember how to rewrite an exponential equation as a logarithmic equation? Try rewriting the following exponential equations as equations involving a logarithm. Watch the **video** to see if you are correct.

a. $2^3 = 8$

b. $5^{-2} = \frac{1}{25}$

c. $1.1^M = z$

3. Changing from Logarithmic to Exponential Form

Do you remember how to rewrite a logarithmic equation as an exponential equation? Try rewriting the following logarithmic equations as equations involving an exponent. Watch the **video** to see if you are correct.

a. $\log_3 81 = 4$

b. $\log_4 16 = y$

c. $\log_{\frac{3}{5}} x = 2$

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5. Expanding and Condensing Logarithmic Expressions

Expand the logarithmic expressions below using properties of logarithms. Work through the **interactive video** to see if you are correct.

a. $\log_7(49x^3\sqrt[5]{y^2})$

b. $\ln\left(\frac{(x^2-4)}{9e^{x^3}}\right)$

6. Solving Logarithmic Equations Using the Logarithm Property of Equality

Write down the **Logarithm Property of Equality**:

Solve the equations below using this property. Work through the **interactive video** to see if you are correct.

a. $\log_7(x-1) = \log_7 12$

b. $2\ln x = \ln 16$

Section 5.4 Objective 1 Solving Exponential Equations

Work through the video that accompanies Example 1: Solve $2^{x+1} = 3$.

Write down the **Solving Exponential Equations** summary found in your eText here:

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Work through the interactive video that accompanies Example 2:
Solve each equation. For part b, round to four decimal places.

a. $3^{x-1} = \left(\frac{1}{27}\right)^{2x+1}$

b. $7^{x+3} = 4^{2-x}$

Work through the interactive video that accompanies Example 3:
Solve each equation. Round to four decimal places.

a. $25e^{x-5} = 17$

b. $e^{2x-1} \cdot e^{x+4} = 11$

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Section 5.4 Objective 2 Solving Logarithmic Equations

Write down the **logarithm property of equality**:

Write down the three **Properties of Logarithms** shown in Objective 2 of your eText.

Work through the video that accompanies Example 4:

$$\text{Solve } 2\log_5(x-1) = \log_5 64.$$

Does the equation above have any extraneous solutions?

What is an extraneous solution?

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Write down the steps for **Solving Logarithmic Equations**.

1.

2.

3.

4.

5.

Work through the video that accompanies Example 5 and take notes here. (Refer to the 5 steps to solving logarithmic equations above.)

Solve $\log_4(2x - 1) = 2$.

Work through the interactive video that accompanies Example 6 and take notes here. (Refer to the 5 steps to solving logarithmic equations that you wrote on the previous page.)

Solve $\log_2(x+10) + \log_2(x+6) = 5$.

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Work through Example 7 and take notes here.

Solve $\ln(x-4) - \ln(x-5) = 2$. Round to four decimal places.