

I. Solve each exponential equation. Keep answers as fraction, if not round to 3 decimal places.  
Must show ALL of YOUR WORK to RECEIVE CREDIT!!

<p>1.) <math>\left(\frac{1}{2}\right)^{3-x} = 16</math></p> <p><math>(2)^{-1(3-x)} = 2^4</math></p> <p><math>-1(3-x) = 4</math></p> <p><math>-3 + x = 4</math></p> <p><math>+3 \quad +3</math></p> <p><math>x = 7</math></p>	<p>2.) <math>\frac{-5e^{x+3}}{-5} = \frac{-10}{-5}</math></p> <p><math>e^{x+3} = 2</math></p> <p><math>\ln e^{x+3} = \ln 2</math></p> <p><math>x+3 = \ln(2)</math></p> <p><math>-3 \quad -3</math></p> <p><math>x = -2.307</math></p>	<p>3.) <math>64^x = 8^{2x+1}</math></p> <p><math>(2^6)^x = (2^3)^{2x+1}</math></p> <p><math>6x = 3(2x+1)</math></p> <p><math>6x = 6x + 3</math></p> <p><math>-6x \quad -6x</math></p> <p><math>0 = 3</math> (false)</p> <p>No solution <math>\emptyset</math></p>	<p>4.) <math>7^{x+2} = 3</math></p> <p><math>\log 7^{x+2} = \log 3</math></p> <p><math>(x+2) \log 7 = \log 3</math></p> <p><math>\log 7 \quad \log 7</math></p> <p><math>x+2 = .564575</math></p> <p><math>-2 \quad -2</math></p> <p><math>x = -1.435</math></p>
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<p>5.) <math>2e^{x-1} + 3 = -5</math></p> <p><math>-3 \quad -3</math></p> <p><math>2e^{x-1} = -8</math></p> <p><math>2 \quad 2</math></p> <p><math>e^{x-1} = -4</math></p> <p><math>\ln e^{x-1} = \ln -4</math></p> <p><math>x-1 = \ln(-4)</math></p> <p><math>+1 \quad +1</math></p> <p>No solution</p>	<p>6.) <math>125^{3x+1} \cdot 625^{-3x} = 125^{-3x}</math></p> <p><math>(5^3)^{3x+1} \cdot (5^4)^{-3x} = (5^3)^{-3x}</math></p> <p><math>3(3x+1) + 4(-3x) = 3(-3x)</math></p> <p><math>9x + 3 - 12x = -9x</math></p> <p><math>-3x + 3 = -9x</math></p> <p><math>+3x \quad +3x</math></p> <p><math>3 = -6x</math></p> <p><math>-6 \quad -6</math></p> <p><math>x = -\frac{1}{2}</math></p>	<p>7.) <math>\frac{16}{3+e^{4x}} = \frac{2}{1}</math></p> <p><math>2(3+e^{4x}) = \frac{16}{2}</math></p> <p><math>3+e^{4x} = 8</math></p> <p><math>-3 \quad -3</math></p> <p><math>e^{4x} = 5</math></p> <p><math>\ln e^{4x} = \ln 5</math></p> <p><math>4x = \frac{\ln(5)}{4}</math></p> <p><math>x = .402</math></p>	<p>8.) <math>243^{2x+2} \cdot 27^{-2x} = 9</math></p> <p><math>(3^5)^{2x+2} \cdot (3^3)^{-2x} = 3^2</math></p> <p><math>5(2x+2) + 3(-2x) = 2</math></p> <p><math>10x + 10 - 6x = 2</math></p> <p><math>4x + 10 = 2</math></p> <p><math>-10 \quad -10</math></p> <p><math>4x = -8</math></p> <p><math>4 \quad 4</math></p> <p><math>x = -2</math></p>
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<p>9.) <math>2^{-x} - 4 = 5</math></p> <p><math>+4 \quad +4</math></p> <p><math>2^{-x} = 9</math></p> <p><math>\log 2^{-x} = \log 9</math></p> <p><math>-x \log 2 = \log 9</math></p> <p><math>- \log 2 \quad - \log 2</math></p> <p><math>x = -3.170</math></p>	<p>10.) <math>36 \cdot \left(\frac{1}{6}\right)^{3-3x} = 216^{-2x-1}</math></p> <p><math>(2 \cdot 6^{-1})^{3-3x} = (6^3)^{-2x-1}</math></p> <p><math>2 - (3-3x) = 3(-2x-1)</math></p> <p><math>2 - 3 + 3x = -6x - 3</math></p> <p><math>3x - 1 = -6x - 3</math></p> <p><math>+6x \quad +6x</math></p> <p><math>9x - 1 = -3</math></p> <p><math>+1 \quad +1</math></p> <p><math>9x = -2</math></p> <p><math>9 \quad 9</math></p> <p><math>x = -\frac{2}{9}</math></p>	<p>11.) <math>4e^{2x+3} - 1 = 11</math></p> <p><math>+1 \quad +1</math></p> <p><math>4e^{2x+3} = 12</math></p> <p><math>4 \quad 4</math></p> <p><math>e^{2x+3} = 3</math></p> <p><math>\ln e^{2x+3} = \ln 3</math></p> <p><math>2x+3 = \ln 3</math></p> <p><math>-3 \quad -3</math></p> <p><math>2x = \ln(3) - 3</math></p> <p><math>x = -.951</math></p>	<p>12.) <math>3^{2-5x} + 5 = 5</math></p> <p><math>-5 \quad -5</math></p> <p><math>3^{2-5x} = 0</math></p> <p><math>\log 3^{2-5x} = \log 0</math></p> <p><math>(2-5x) \log 3 = \log 0</math></p> <p><math>\log 3 \quad \log 3</math></p> <p>No solution <math>\emptyset</math></p>
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key wanted  
 II. Solve each logarithmic equation. Keep answers as fraction, if not round to 3 decimal places.  
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13.) $\log(3x+5)=2$ $10^2 = 3x+5$ $100 = 3x+5$ $\frac{-5}{-5} \quad \frac{-5}{-5}$ $95 = 3x$ $\frac{95}{3} = \frac{3x}{3}$ $x = \frac{95}{3}$	14.) $2 - \ln(3-x) = 0$ $\frac{-2}{-2} \quad \frac{2}{2}$ $-\ln(3-x) = 2$ $\frac{-1}{-1} \quad \frac{-1}{-1}$ $\ln(3-x) = -2$ $e^{\ln(3-x)} = e^{-2}$ $3-x = e^{-2}$ $\frac{-3}{-3} \quad \frac{-3}{-3}$ $-x = e^{-2} - 3$ $\frac{-1}{-1} \quad \frac{-1}{-1}$ $x = 3 - e^{-2}$ $x = -4.389$	15.) $\log_3(2-x)=3$ $3^3 = 2-x$ $27 = 2-x$ $\frac{-2}{-2} \quad \frac{-2}{-2}$ $25 = -x$ $\frac{-1}{-1} \quad \frac{-1}{-1}$ $x = -25$	16.) $\ln \sqrt{x+4} = 3$ $e^{(\sqrt{x+4})^2} = (e^3)^2$ $x+4 = e^6$ $\frac{-4}{-4} \quad \frac{-4}{-4}$ $x = 399.429$
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17.) $\log_4(\ln x + 5) = 2$ $4^2 = \ln x + 5$ $16 = \ln x + 5$ $\frac{-5}{-5} \quad \frac{-5}{-5}$ $11 = \ln x$ $e^{11} = x$ $x = e^{11}$ $x = 59874.142$	18.) $\ln(2+x) - \ln(x-3) = 1$ $e^{\ln(\frac{2+x}{x-3})} = e^1$ $\frac{2+x}{x-3} = \frac{2.718282}{1}$ $2.718282x - 8.154845 = 2+x$ $\frac{-x}{-x} \quad \frac{+5.154845}{+5.154845} \quad \frac{-2}{-2}$ $1.718282x = 10.154845$ $\frac{1.718282}{1.718282} \quad \frac{10.154845}{1.718282}$ $x = 5.910$	19.) $2 \log x = \log 2 + \log(3x-4)$ $\log x^2 = \log(2(3x-4))$ $x^2 = 6x - 8$ $x^2 - 6x + 8 = 0$ $(x-4)(x-2) = 0$ $x = 4 \quad x = 2$	20.) $\log_5\left(\frac{x+1}{x-1}\right) = 2$ $5^2 = \frac{x+1}{x-1}$ $\frac{25}{1} \times \frac{x-1}{x-1} = \frac{x+1}{x-1}$ $25x - 25 = x + 1$ $\frac{-x}{-x} \quad \frac{+25}{+25} \quad \frac{+1}{+1}$ $24x = 26$ $\frac{24}{24} \quad \frac{26}{24}$ $x = \frac{13}{12}$
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21.) $\log(2x-3) = \log(3-2x) - \log x$ $\log(2x-3) = \log\left(\frac{3-2x}{x}\right)$ $\frac{2x-3}{1} = \frac{3-2x}{x}$ $2x^2 - 3x = 3 - 2x$ $\frac{+2x-3}{+2x-3} \quad \frac{=3}{=3} \quad \frac{+2x}{+2x}$ $2x^2 - x - 3 = 0$ $(2x-3)(x+1) = 0$ $x = \frac{3}{2} \quad x = -1$ $\downarrow \quad \downarrow$ $\text{ex sol} \quad \text{ex sol}$ $\text{no solution}$	22.) $\log_9(x-5) + \log_9(x+3) = 1$ $\log_9((x-5)(x+3)) = 1$ $9^1 = x^2 - 2x - 15$ $9 = x^2 - 2x - 15$ $\frac{-9}{-9} \quad \frac{-9}{-9}$ $x^2 - 2x - 24 = 0$ $(x-6)(x+4) = 0$ $x = 6 \quad x = -4$ $\downarrow \quad \downarrow$ $\text{ex sol} \quad \text{ex sol}$	23.) $\ln(5x-3) = \ln(x-1)$ $5x-3 = x-1$ $\frac{-x}{-x} \quad \frac{+3}{+3} \quad \frac{-1}{-1}$ $4x = 2$ $\frac{4}{4} \quad \frac{2}{4}$ $x = \frac{1}{2} \rightarrow \text{ex sol}$ $\text{no solution}$
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