

key points:

e is just a base

log answer = exponent  
base

$$\ln x = \log_e x$$

Name \_\_\_\_\_

Date \_\_\_\_\_

Advanced Algebra

Unit 3: Exponential, Log, and Power Functions Assignment #16

Solve the following exponential equations:

<p>1) <math>e^x = 12</math>  <math>\log_e e^x = \log_e 12</math>  <math>x \log_e e = \log_e 12</math>  <math>x = \log_e 12</math> or <math>x = \ln 12</math></p>	<p>2) <math>2^x = 1.5</math>  <math>\log_2 2^x = \log_2 1.5</math>  <math>x \log_2 2 = \log_2 1.5</math>  <math>x = \log_2 1.5</math> (0.58)</p>	<p>3) <math>4^x - 5 = 3</math>  <math>4^x = 8</math>  <math>x \log_4 4 = \log_4 8</math>  <math>x = 1.5</math></p>
<p>4) <math>10^{2x} + 3 = 8</math>  <math>10^{2x} = 5</math>  <math>2x = \log_{10} 5</math>  <math>x = .35</math></p>	<p>5) <math>6e^{-x} = 3</math>  <math>e^{-x} = \frac{1}{2}</math>  <math>-x = \ln(\frac{1}{2})</math>  <math>x = .69</math></p>	<p>6) <math>\frac{1}{2} e^{3x} = 20</math>  <math>e^{3x} = 40</math>  <math>\ln e^{3x} = \ln 40</math>  <math>3x = \ln 40</math> (x=1.22)</p>
<p>7) <math>5(2)^{3x} - 4 = 13</math>  <math>2^{3x} = (\frac{17}{5})</math>  <math>3x = \log_2 (\frac{17}{5})</math>  <math>x = .59</math></p>	<p>8) <math>1.2 e^{-5x} + 2.6 = 3</math>  <math>1.2 e^{-5x} = .4</math>  <math>e^{-5x} = .333</math>  <math>-5x = \ln .333</math>  <math>x = .22</math></p>	<p>9) <math>-12 e^{-x} + 8 = 7</math>  <math>-12 e^{-x} = -1</math>  <math>e^{-x} = (\frac{1}{12})</math>  <math>-x = \ln(\frac{1}{12}) = 2.48</math></p>
<p>10) <math>\frac{2}{3}(3)^{4x} + \frac{1}{3} = 4</math>  <math>\frac{12}{3} - \frac{1}{3}</math>  <math>3^{4x} = \frac{11}{2}</math>  <math>4x = \log_3 (\frac{11}{2})</math>  <math>x = .39</math></p>	<p>11) <math>6^{-1x} + 5 = 10</math>  <math>6^{-1x} = 5</math>  <math>-1x = \log_6 5</math> (8.98)</p>	<p>12) <math>(\frac{1}{4})^x - \frac{3}{5} = 1</math>  <math>(\frac{1}{4})^x = \frac{8}{5}</math>  <math>x = \log_4 (\frac{8}{5})</math> (-.34)</p>
<p>13) <math>\frac{1}{2}(8)^{2x} + 2 = 9</math>  <math>\frac{1}{2}(8)^{2x} = 7</math>  <math>8^{2x} = 14</math>  <math>2x = \log_8 14</math> (.63)</p>	<p>14) <math>\frac{1}{4}(3)^{-x} - 18 = 18</math>  <math>\frac{1}{4}(3)^{-x} = 36</math>  <math>3^{-x} = 144</math>  <math>-x = \log_3 144</math> (-4.5)</p>	<p>15) <math>10^{-12x} + 6 = 100</math>  <math>10^{-12x} = 94</math>  <math>-12x = \log_{10} 94</math>  <math>x = -.16</math></p>
<p>16) <math>12 + 3(3)^{-1x} = 16</math>  <math>3 \cdot 3^{-1x} = 4</math>  <math>3^{-1x} = (\frac{4}{3})</math>  <math>\log_3 3^{-1x} = \log_3 (\frac{4}{3})</math>  <math>-1x = \log_3 (\frac{4}{3})</math>  <math>x = 2.62</math></p>	<p>17) <math>4 - 2e^x = -23</math>  <math>-2e^x = -27</math>  <math>e^x = (\frac{27}{2})</math>  <math>x = \ln(\frac{27}{2})</math> (2.6)</p>	<p>18) <math>-16 + .2(10)^x = 35</math>  <math>.2(10)^x = 51</math>  <math>10^x = 255</math>  <math>x = \log_{10} 255</math> (2.4)</p>

Sometimes it helps to re-write

Solve the logarithmic equation:

<p>19) <math>\ln x = 4</math></p> $\log_e x = 4$ $e^4 = x$ <p style="text-align: center;"><u>54.6</u></p>	<p>20) <math>\log_2 x = -1</math></p> $2^{-1} = x$ <p style="text-align: center;"><u><math>\frac{1}{2}</math></u></p>	<p>21) <math>\log_{10} 2x = 1.5</math></p> $10^{1.5} = 2x$ <p style="text-align: center;"><u>15.8</u></p>
<p>22) <math>\ln \frac{1}{2}x = \frac{1}{4}</math></p> $\log_e \frac{1}{2}x = \frac{1}{4}$ $e^{\frac{1}{4}} = \frac{1}{2}x$ <p style="text-align: center;"><u>2.6</u></p>	<p>23) <math>4 \log_3 x = 28</math></p> $\log_3 x = 7$ <p style="text-align: center;"><u><math>3^7 = x</math></u></p>	<p>24) <math>16 \ln x = 30</math></p> $\ln x = \left(\frac{30}{16}\right)$ $\log_e x = \left(\frac{30}{16}\right)$ $e^{\frac{30}{16}} = x$ <p style="text-align: center;"><u>6.5</u></p>
<p>25) <math>1 - 2 \ln x = -4</math></p> $-2 \ln x = -5$ $\ln x = \frac{5}{2}$ $e^{\frac{5}{2}} = x$	<p>26) <math>\frac{1}{3} \log_2 x + 5 = 7</math></p> $\frac{1}{3} \log_2 x = 2$ $\log_2 x = 6$ <p style="text-align: center;"><u><math>x = 64</math></u></p>	<p>27) <math>2 \ln(-x) + 7 = 14</math></p> $\ln(-x) = \left(\frac{7}{2}\right)$ $\log_e(-x) = \left(\frac{7}{2}\right)$ $e^{\frac{7}{2}} = -x$ <p style="text-align: center;"><u>-33.1</u></p>

Remember:

$\log$  base Answer = exponent

Important Notes

$$\ln x = \log_e x$$

3 cases

①  $\log_2 8 = x$

Just use calculator

②  $\log_2 8 = 3$

Re-write this, it is a Power function  
 $x^3 = 8$  so  $x = 2$

③  $\log_2 x = 4$

Re-write this. It is a Basic exponential

$$2^4 = x$$

16