

# Day 05 Mixed Equations Practice 1

Name Master E  
Date \_\_\_\_\_ Block \_\_\_\_\_

Solve each equation. Round to three decimal places when necessary.

<p>1. <math>7\log x = 21</math></p> $\log x = 3$ $10^3 = x$ $x = 1000$	<p>2. <math>25^{x+2} = 625</math></p> $5^{2(x+2)} = 5^4$ $2(x+2) = 4$ $2x + 4 = 4$ $2x = 0$ $x = 0$	<p>3. <math>\ln 4x - 6 = 8</math></p> $\ln 4x = 14$ $e^{14} = 4x$ $\frac{e^{14}}{4} = x$ $x \approx 300651.071$
<p>4. <math>\log(2x+1) + 4 = 5</math></p> $\log(2x+1) = 1$ $10^1 = 2x+1$ $10 = 2x+1$ $9 = 2x$ $x = \frac{9}{2}$ $x = 4.5$	<p>5. <math>2^x + 7 = 135</math></p> $2^x = 128$ $2^x = 2^7$ $x = 7$	<p>6. <math>\frac{1}{16} = 8^{4x-2}</math></p> $2^{-4} = 2^{3(4x-2)}$ $-4 = 3(4x-2)$ $-4 = 12x - 6$ $2 = 12x \quad x = \frac{2}{12}$ $x = \frac{1}{6}$
<p>7. <math>2^{x+1} = 16^{2x}</math></p> $2^{x+1} = 2^{4(2x)}$ $x+1 = 4(2x)$ $x+1 = 8x$ $1 = 7x$ $x = \frac{1}{7}$	<p>8. <math>\log_4 x = \frac{3}{2}</math></p> $4^{\frac{3}{2}} = x$ $(\sqrt{4})^3 = x$ $(2)^3 = x$ $x = 8$	<p>9. <math>3^{2x-5} = 7</math></p> $\log_3 3^{2x-5} = \log_3 7$ $2x-5 = 1.771\dots$ $2x = 6.771\dots$ $x \approx 3.386$
<p>10. <math>\frac{2}{3}e^{3x} + 1 = 10</math></p> $\frac{2}{3}e^{3x} = 9$ $e^{3x} = 13.5$ $\ln 13.5 = 3x$ $x = \frac{\ln 13.5}{3}$ $x \approx .868$	<p>11. <math>\log x + \log(x-3) = 1</math></p> $\log x(x-3) = 1$ $10^1 = x(x-3)$ $10 = x^2 - 3x$ $0 = x^2 - 3x - 10$ $0 = (x-5)(x+2)$ $x = 5, -2$ $x = 5$	<p>12. <math>8(3^{x-1}) - 1 = 73</math></p> $8(3^{x-1}) = 74$ $3^{x-1} = 9.25$ $\log_3 9.25 = x-1$ $2.025\dots = x-1$ $x \approx 3.025$

extraneous  
bc log -2  
is undefined

13.  $\ln x = 5$

$$e^5 = x$$

$$x \approx 148.413$$

14.  $((3x-1)^{\frac{4}{3}})^{\frac{3}{4}} = (16)^{\frac{3}{4}}$

$$3x-1 = \pm (4\sqrt[4]{16})^3$$

$$3x-1 = \pm 8$$

$$3x-1=8 \quad 3x-1=-8$$

$$3x=9 \quad 3x=-7$$

$$x=3 \quad x=-\frac{7}{3}$$

15.  $4 - \ln x = 1$

$$-\ln x = -3$$

$$\ln x = 3$$

$$e^3 = x$$

$$x \approx 20.086$$

16.  $2 + \log_2 3x = 8$

$$\log_2 3x = 6$$

$$2^6 = 3x$$

$$x = \frac{2^6}{3} = \frac{64}{3}$$

$$x \approx 21.333$$

17.  $\log_{\frac{1}{9}}(x-1) = \frac{1}{2}$

$$\left(\frac{1}{9}\right)^{\frac{1}{2}} = \dots$$

-2 is extraneous

$$9^{\frac{1}{2}} =$$

$$\pm 3 = x-1$$

$$x-1=3 \quad x-1=-3$$

$$x=4 \quad x=-2$$

18.  $\log_{27}(x-4) = \log_{27}(8-2x)$

$$x-4 = 8-2x$$

$$3x-4=8$$

$$3x=12$$

$$x=4$$

$$n > 0 \rightarrow \emptyset$$

19.  $\log(x+2) + \log(x-3) = \log(x+29)$

$$\log(x+2)(x-3) = \log(x+29)$$

$$x^2 - x - 6 = x + 29$$

$$x^2 - 2x - 35 = 0$$

$$(x-7)(x+5) = 0$$

$$x=7, -5 \leftarrow \text{extr.}$$

$$x=7$$

20.  $\log x = 0.0124$

$$10^{0.0124} = x$$

$$x \approx 1.029$$

21.  $\log_2(x+1) = \log_4(2x+3)$

$$\log_2(x+1) = \frac{\log_2(2x+3)}{\log_2 4}$$

$$2\log_2(x+1) = \log_2(2x+3)$$

$$(x+1)^2 = 2x+3$$

$$x^2 + 2x + 1 = 2x + 3$$

$$x^2 = 2$$

$$x = \pm\sqrt{2}$$

$$x = \sqrt{2}$$

$$x \approx 1.414$$

22.  $\log_6(5x+14) = 2\log_6 x$

$$\log_6(5x+14) = \log_6 x^2$$

$$5x+14 = x^2$$

$$x^2 - 5x - 14 = 0$$

$$(x-7)(x+2) = 0$$

$$x = 7, -2$$

$$x=7$$

23.  $\log_3 23 = x$

$$\frac{\log 23}{\log 3} = x$$

$$x \approx 2.854$$

24.  $\log_2 x + \log_2(x+1) = 1$

$$\log_2 x(x+1) = 1$$

$$2^1 = x^2 + x$$

$$x^2 + x - 2 = 0$$

$$(x+2)(x-1) = 0$$

$$-2, 1$$

$$x=1$$

# Day 06 Mixed Equations Practice 2

Name Master E  
Date \_\_\_\_\_ Block \_\_\_\_\_

Solve each equation. Round to three decimal places when necessary.

1.  $\log_{32} x = \frac{1}{5}$   
 $32^{\frac{1}{5}} = x$   
 $2 = x$   
 $x = 2$

2.  $\log 10x = 3 - \log x$   
 $\log 10x + \log x = 3$   
 $\log 10x^2 = 3$   
 $10^3 = 10x^2$   
 $1000 = 10x^2$   
 $100 = x^2$   
 $x = \pm 10$   
 $x = 10$

3.  $\ln x = 3.4$   
 $e^{3.4} = x$   
 $x \approx 29.964$

4.  $5^{x-1} = 3^x$   
 $\log_5 3^x = x-1$   
 $x \log_5 3 = x-1$   
 $.683x = x-1$   
 $-.317x = -1$   
 $x \approx 3.151$

5.  $3^{2x} = 7^{x-1}$   
 $\log_7 3^{2x} = x-1$   
 $2x \log_7 3 = x-1$   
 $1.129x = x-1$   
 $.129x = -1$   
 $x \approx -7.743$

6.  $\log_2 4 + \log_2 6 = \log_2 x$   
 $\log_2 24 = \log_2 x$   
 $x = 24$

7.  $5^x = 100$   
 $\log_5 100 = x$   
 $x \approx 2.861$

8.  $2 \ln(3x-5) = 8$   
 $\ln(3x-5) = 4$   
 $e^4 = 3x-5$   
 $e^4 + 5 = 3x$   
 $\frac{e^4 + 5}{3} = x$   
 $x \approx 19.866$

9.  $5^{3x} = 128$   
 $\log_5 128 = 3x$   
 $\frac{\log_5 128}{3} = x$   
 $x \approx 1.005$

10.  $\log_3 12 - \log_3 x = \log_3 3$   
 $\log_3 \frac{12}{x} = \log_3 3$   
 $\frac{12}{x} = 3$   
 $12 = 3x$   
 $x = 4$

11.  $y^{\frac{-2}{3}} = 4$   
 $(y^{\frac{-2}{3}})^{-\frac{3}{2}} = (4)^{-\frac{3}{2}}$   
 $y = (\sqrt{4})^{-3}$   
 $y = (2)^{-3}$   
 $y = \frac{1}{8}$

12.  $\log_8 x + \log_8 (x-3) = \frac{2}{3}$   
 $\log_8 x(x-3) = \frac{2}{3}$   
 $8^{\frac{2}{3}} = x^2 - 3x$   
 $4 = x^2 - 3x$   
 $x^2 - 3x - 4 = 0$   
 $(x-4)(x+1) = 0$   
 $x = 4, -1$   
 extr.  $x = 4$

13.  $10^{x-1} = 1000$

$$10^{x-1} = 10^3$$

$$x-1=3$$

$$x=4$$

14.  $64^{\frac{x}{6}} = 128$

$$(2^6)^{\frac{x}{6}} = 2^7$$

$$2^x = 2^7$$

$$x=7$$

15.  $\log_2(4x+10) - \log_2(x+1) = 3$

$$\log_2 \frac{4x+10}{x+1} = 3$$

$$2^3 = \frac{4x+10}{x+1}$$

$$8(x+1) = 4x+10$$

$$8x+8 = 4x+10$$

$$4x = 2 \quad x = \frac{1}{2}$$

16.  $e^{x-3} = 10^{4-x}$

$$\log_e e^{x-3} = 4-x$$

$$(x-3)\log_e = 4-x$$

$$.434x - 1.303 = 4-x$$

$$1.434x = 5.303$$

$$x \approx 3.698$$

17.  $\log_4(x-3) + \log_4(x+3) = 2$

$$\log_4(x-3)(x+3) = 2$$

$$4^2 = x^2 - 9$$

$$16 = x^2 - 9$$

$$25 = x^2$$

$$x = \pm 5 \quad x = 5$$

18.  $\log_4(x+6) - \log_4 x = 2$

$$\log_4 \frac{x+6}{x} = 2$$

$$4^2 = \frac{x+6}{x}$$

$$16x = x+6$$

$$15x = 6$$

$$x = \frac{6}{15} \quad x = \frac{2}{5}$$

19.  $5 = \log_3 8 - \log_3(x+6)$

$$5 = \log_3 \frac{8}{x+6}$$

$$3^5 = \frac{8}{x+6}$$

$$243(x+6) = 8$$

$$243x + 1458 = 8$$

$$243x = -1450$$

$$x \approx -5.967$$

20.  $\log_{27}(11-2x) = \frac{1}{3}$

$$27^{\frac{1}{3}} = 11-2x$$

$$3 = 11-2x$$

$$-8 = -2x$$

$$x = 4$$

21.  $\log(24x+64) = 3$

$$10^3 = 24x+64$$

$$1000 = 24x+64$$

$$936 = 24x$$

$$x = 39$$

22.  $\frac{1}{2} \log_2 36 = \log_2(7x+1)$

$$\log_2 36^{\frac{1}{2}} = \log_2(7x+1)$$

$$6 = 7x+1$$

$$5 = 7x$$

$$\frac{5}{7} = x$$

23.  $3e^{4x-7} - 8 = 106$

$$3e^{4x-7} = 114$$

$$e^{4x-7} = 38$$

$$\ln 38 = 4x-7$$

$$(\ln 38) + 7 = 4x$$

$$\frac{(\ln 38) + 7}{4} = x$$

$$x \approx 2.659$$

24.  $\log_2(x+4) = \log_4(x+4)$

$$\log_2(x+4) = \frac{\log_2(x+4)}{\log_2 4}$$

$$2 \log_2(x+4) = \log_2(x+4)$$

$$(x+4)^2 = x+4$$

$$x^2 + 8x + 16 = x+4$$

$$x^2 + 7x + 12 = 0$$

$$(x+3)(x+4) = 0$$

$$x = -3, -4 \quad x = -3$$