

4.3 8, 12, 34, 40, 48

HW #6

#8 $\log_2 \frac{1}{8} = -3 \longrightarrow \boxed{2^{-3} = \frac{1}{8}}$

#12 $16^{1/2} = 4 \longrightarrow \boxed{\log_{16} 4 = \frac{1}{2}}$

#34 $2 \ln 5 - \frac{1}{2} \ln 25 \longrightarrow \ln 5^2 - \ln 25^{1/2} \longrightarrow \ln 25 - \ln 5 \longrightarrow \ln \frac{25}{5} \longrightarrow \boxed{\ln 5}$

#40 $\ln\left(\frac{3x}{5y}\right) = \ln 3x - \ln 5y = [\ln 3 + \ln x] - [\ln 5 + \ln y]$
 $= \boxed{\ln 3 + \ln x - \ln 5 - \ln y}$

#48 $\log_{30} 78 = \frac{\ln 78}{\ln 30} = \boxed{1.2809...}$

4.4 #6, 10, 16, 26, 36, 46, 54

#6 $\ln(k+5) + \ln(k+2) = \ln 18k$
 $\ln[(k+5)(k+2)] = \ln 18k$
 $(k+5)(k+2) = 18k$
 $k^2 + 7k + 10 = 18k$
 $k^2 - 11k + 10 = 0$

$(k-10)(k-1) = 0$
 $\boxed{k=10 \text{ or } k=1}$
 check

$\ln 15 + \ln 12 = \ln 180$ ✓

$\ln 6 + \ln 3 = \ln 18$ ✓

#10 $\log m - \log(m+4) = -2$

$\log\left(\frac{m}{m+4}\right) = -2$

$\frac{m}{m+4} = 10^{-2}$

$\frac{m}{m+4} = \frac{1}{100}$

$100m = m+4$

$99m = 4$

$\boxed{m = \frac{4}{99}}$

check ✓

#16 $\log(x-1) + \log(x+2) = 1$

$\log[(x-1)(x+2)] = 1$

$(x-1)(x+2) = 10$

$x^2 + x - 2 = 10$

$x^2 + x - 12 = 0$

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

$x = -4 \text{ or } x = 3$
 check.

$\log(-5) + \dots$
 Xoops

$\log 2 + \log 5 = 1$

$\boxed{x = 3}$

4.4 continued

#26 $81^{-2x} = 3^{x-1}$
 $(3^4)^{-2x} = 3^{x-1}$
 $3^{-8x} = 3^{x-1}$

$-8x = x-1$
 $-9x = -1$
 $x = \frac{1}{9}$

#36 $4^{3x-1} = 3^{x-2}$
 $\ln 4^{3x-1} = \ln 3^{x-2}$
 $(3x-1)\ln 4 = (x-2)\ln 3$
 $3x\ln 4 - \ln 4 = x\ln 3 - 2\ln 3$
 $3x\ln 4 - x\ln 3 = \ln 4 - 2\ln 3$

$x(3\ln 4 - \ln 3) = \ln 4 - 2\ln 3$
 $x = \frac{\ln 4 - 2\ln 3}{3\ln 4 - \ln 3}$
 $x = -.265$

#46 $\log_4(z+3) + \log_4(z-3) = 2$
 $\log_4[(z+3)(z-3)] = 2$
 $(z+3)(z-3) = 4^2$
 $z^2 - 9 = 16$
 $z^2 = 25$

$z = \pm 5$
 check
 $z = -5$ $\log_4(-2)$ ööp
 $z = 5$ $\log_4 8 + \log_4 2 = 2$
 $z = 5$

#54 $5^{x^2+x} = 1$
 $5^{x^2+x} = 5^0$
 $x^2+x = 0$
 $x(x+1) = 0$

$x = 0 \text{ OR } x = -1$

6.1 #12, 14, 16

#12 $4x - 3y = -1$
 $x + 2y = 19 \xrightarrow{x \cdot 4} \begin{array}{r} 4x - 3y = -1 \\ -4x - 8y = -76 \\ \hline -11y = -77 \\ y = 7 \end{array}$

$4x - 21 = -1$
 $4x = 20$
 $x = 5$
 check in other equation
 $5 + 14 = 19 \checkmark$
 $(5, 7)$

#14 $2x + 5y = 8$
 $6x + 15y = 18 \xrightarrow{x \cdot 3} \begin{array}{r} 2x + 5y = 8 \\ -6x - 15y = -24 \\ \hline 6x + 15y = 18 \\ \hline 0 = -6 \end{array}$

NO SOLUTION

6.1 #16

$$\begin{array}{rcl} 3x - 2y = 4 & \xrightarrow{x=2} & -6x + 4y = -8 \\ 6x - 4y = 8 & & \underline{6x - 4y = 8} \\ & & 0 = 0 \end{array}$$

same line

$$\begin{aligned} 3x &= 4 + 2y \\ x &= \frac{4}{3} + \frac{2}{3}y \end{aligned}$$

$$\left\{ \left(\frac{4}{3} + \frac{2}{3}y, y \right) \mid y \in \mathbb{R} \right\}$$

6.2 # 34 & 54

#34

$$\begin{array}{rcl} x - 2y + 5z = -6 \\ x + 2y + 3z = 0 \\ x + 3y + 2z = 5 \end{array} \rightarrow \left[\begin{array}{ccc|c} 1 & -2 & 5 & -6 \\ 1 & 2 & 3 & 0 \\ 1 & 3 & 2 & 5 \end{array} \right] \xrightarrow{-R_1 + R_2 \rightarrow R_2}$$

$$\left[\begin{array}{ccc|c} 1 & -2 & 5 & -6 \\ 0 & 4 & -2 & 6 \\ 1 & 3 & 2 & 5 \end{array} \right] \xrightarrow{-R_1 + R_3 \rightarrow R_3} \left[\begin{array}{ccc|c} 1 & -2 & 5 & -6 \\ 0 & 4 & -2 & 6 \\ 0 & 5 & -3 & 11 \end{array} \right] \xrightarrow{-R_2 + R_3 \rightarrow R_3}$$

$$\left[\begin{array}{ccc|c} 1 & -2 & 5 & -6 \\ 0 & 4 & -2 & 6 \\ 0 & 1 & -1 & 5 \end{array} \right] \xrightarrow{R_2 \leftrightarrow R_3} \left[\begin{array}{ccc|c} 1 & -2 & 5 & -6 \\ 0 & 1 & -1 & 5 \\ 0 & 4 & -2 & 6 \end{array} \right] \xrightarrow{-4R_2 + R_3}$$

$$\left[\begin{array}{ccc|c} 1 & -2 & 5 & -6 \\ 0 & 1 & -1 & 5 \\ 0 & 0 & 2 & -14 \end{array} \right] \xrightarrow{\frac{1}{2}R_3} \left[\begin{array}{ccc|c} 1 & -2 & 5 & -6 \\ 0 & 1 & -1 & 5 \\ 0 & 0 & 1 & -7 \end{array} \right]$$

$$x - 2y + 5z = -6$$

$$y - z = 5$$

$$z = -7$$

$$\begin{aligned} y + 7 &= 5 \\ y &= -2 \end{aligned}$$

$$\begin{aligned} x + 4 - 35 &= -6 \\ x &= 25 \end{aligned}$$

$$\boxed{(25, -2, -7)}$$

check in other equations

$$25 - 4 + -21 = 0 \checkmark$$

$$25 + -6 + -14 = 5 \checkmark$$

2 #54

$$\begin{aligned} 2x + y &= 7 \\ x - y &= 3 \\ x + 3y &= 4 \end{aligned} \rightarrow \left[\begin{array}{cc|c} 2 & 1 & 7 \\ 1 & -1 & 3 \\ 1 & 3 & 4 \end{array} \right] \xleftrightarrow{R_1 \leftrightarrow R_2} \left[\begin{array}{cc|c} 1 & -1 & 3 \\ 2 & 1 & 7 \\ 1 & 3 & 4 \end{array} \right]$$

$$\xrightarrow{-2R_1 + R_2} \left[\begin{array}{cc|c} 1 & -1 & 3 \\ 0 & 3 & 1 \\ 1 & 3 & 4 \end{array} \right] \xrightarrow{-R_1 + R_3} \left[\begin{array}{cc|c} 1 & -1 & 3 \\ 0 & 3 & 1 \\ 0 & 4 & 1 \end{array} \right] \xrightarrow{-R_2 + R_3} \left[\begin{array}{cc|c} 1 & -1 & 3 \\ 0 & 3 & 1 \\ 0 & 1 & 0 \end{array} \right]$$

$$\xrightarrow{R_2 \leftrightarrow R_3} \left[\begin{array}{cc|c} 1 & -1 & 3 \\ 0 & 1 & 0 \\ 0 & 3 & 1 \end{array} \right] \xrightarrow{-3R_2 + R_3} \left[\begin{array}{cc|c} 1 & -1 & 3 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array} \right]$$

The last equation is $0 = 1$

NO SOLUTION