3-6 | Systems with 3 variables |

$$x - 3y + 3z = -4$$
$$2x + 3y - z = 15$$
$$4x - 3y - z = 15$$

Step 1 Eliminate 1 variable by choosing 2 of the equations

$$\begin{array}{rl} & x-3y+3z=-4 \\ + & 2x+3y-z=15 \\ \hline & 3x \quad +2z=11 \end{array}$$

Step 2 Eliminate the SAME variable from the remaining equation and either of the other equations:

$$\begin{array}{r} 2x+3y-z=15 \\ 4x-3y-z=19 \\ \hline 6x \qquad -2z=34 \end{array}$$

Step 3 Eliminate a variable using the 2 revised equations:

$$3x + 2z = 11$$
$$6x - 2z = 34$$
$$9x = 45$$
$$x = 5$$

Step 4) Find the solution of the other variable in the revised equation:

$3x + 2z = 11$

$x = 5$

$15 + 2z = 11$

$2z = -4$

$z = -2$

Step 5 Find the solution of the remaining variable by using one of the original equations.

$x = 5$

$z = -2$

$x - 3y + 3z = -4$

$5 - 3y - 6 = -4$

$-3y - 1 = -4$

$-3y = -3$

$y = 1$

Step 6 Check it in all 3 equations

$x = 5$

$y = 1$

$z = -2$

$x - 3y + 3z = -4$

$5 - 3 - 6 = -4$ $\quad 5 - 9 = -4$ ✓

$2x + 3y - z = 15$

$10 + 3 + 2 = 15$ $\quad 15 = 15$ ✓

$4x - 3y - z = 19$

$20 - 3 + 2 = 19$ $\quad 19 = 19$ ✓

Solve $3x-y+z=-15$

$x+2y-z=1$

$2x+3y-2z=0$

$3x-y+z=-15$

$+\ x+2y-z=1$

$4x+y=-14$

$4x+y=-14$

$2(3x-y+z=-15)$

$2x+3y-2z=0$ other equation

$6x-2y+2z=-30$

$+\quad 2x+3y-2z=0$

$8x+y=-30$

add

$-1(4x+y=-14)$

$$8x+y=-30$$
$$-1(4x+y=-14)$$

$$8x+y=-30$$
$$+\ -4x-y=14$$

$$4x=-16$$
$$x=-4$$

← now evaluate to find y and z