3.6 - Systems with 3 Variables

x - y - z

Elimination

#1 Eliminate a variable - combine 2 eqs.
#2 Eliminate same variable w/ 3rd eqn and one other eqn.

① $x + y + z = 6$
② $2x - y + 3z = 9$
③ $-x + 2y + 2z = 9$

Eqn 1 & 2: $x + y + z = 6$
$2x - y + 3z = 9$
$3x + 4z = 15$

Eq 2 & 3: $2(2x - y + 3z) = 9(2)$
$-x + 2y + 2z = 9$
$4x - 2y + 6z = 18$
$3x + 8z = 27$

⟷ 2 equations 2 variables

$-1(3x + 4z) = 15(-1)$ → $-3x - 4z = -15$
$3x + 8z = 27$
$4z = +12$
$z = 3$

$3x + 4(3) = 15$
$3x + 12 = 15$
$3x = 3$
$x = 1$

$x + y + z = 6$
$1 + y + 3 = 6$
$4 + y = 6$
$y = 2$

(x, y, z)
$(1, 2, 3)$ **Solution**

Always check work

Substitution

+ Solve equation for a variable
+ Substitute above term into remaining equations.
+ Write the 2 equations as a system as outlined in 3.2 (sys of 2 eqn) & solve.

$x + y + z = -8$

$x - y - z = 6 \Rightarrow x = y + z + 6$

$2x - 3y + 2z = -1$

$(y + z + 6) + y + z = -8 \Rightarrow 2y + 2z + 6 = -8$

$-6 \quad -6$

$2y + 2z = -14$

$2(y + z + 6) - 3y + 2z = -1$

$2y + 2z + 12 - 3y + 2z = -1$

$-12 \quad -12$

$\Rightarrow (2)(-y + 4z) = (-13)(2)$

$2y + 2z = -14$

$-2y + 8z = -26$

$10z = -40$

$z = -4$

$x + y + z = -8$

$x + -3 - 4 = -8$

$x + (-7) = -8$

$x = -1$

$2y + 2(-4) = -14$

$2y - 8 = -14$

$2y = -6$

$y = -3$

$(-1, -3, -4)$