## 8.5 Systems w/ three variables

<u>Ordered triplet</u>: a solution to a system of equations in three variables.

Ex1: Is $(-7, \overset{x}{5}, \overset{y}{2})$ the solution to the system
$$2x - 3y = -19 - 5z$$
$$x + 9y - 3z = 32$$
$$-4y - 7z = 6x + 8$$

$2(-7) - 3(5) = -19 - 5(2)$
$-14 - 15 = -19 - 10$
$-29 = -29 \checkmark$

$-4(5) - 7(2) = 6(-7) + 8$
$-20 - 14 = -42 + 8$
$-34 = -34 \checkmark$

$-7 + 9(5) - 3(2) = 32$
$-7 + 45 - 6 = 32$
$32 = 32 \checkmark$

Since $(-7, 5, 2)$ is true for all the equations it is the ordered triplet.

Ex2: Solve the system of equations
$$x + 3y - z = -10$$
$$-2x + 6y + 3z = 1$$
$$4x - 7y - z = 13$$

$x = -3y + z - 10$

$-2(-3y + z - 10) + 6y + 3z = 1$
$6y - 2z + 20 + 6y + 3z = 1$
$-3(12y + z = -19)$

$\quad -36y - 3z = 57$
$+ (-19y + 3z = 53)$
$\quad -55y = 110$
$\quad y = -2$

$x + 3(-2) - 5 = -10$
$x - 6 - 5 = -10$
$x - 11 = -10$
$x = 1$

$4(-3y + z - 10) - 7y - z = 13$
$-12y + 4z - 40 - 7y - z = 13$
$-19y + 3z = 53$

$-19(-2) + 3z = 53$
$38 + 3z = 53$
$3z = 15$
$z = 5$

$(1, -2, 5)$

① $-r + 2s - 2t = -19$
  $5r - s - t = 20$
  $4r + 5s + t = 21$

$r = 2s - 2t + 19$

$5(2s - 2t + 19) - s - t = 20$

$10s - 10t + 95 - s - t = 20$

$9s - 11t + 95 = 20$

✳ $9s - 11t = -75$ ✳

$4(2s - 2t + 19) + 5s + t = 21$

$8s - 8t + 76 + 5s + t = 21$

$13s - 7t + 76 = 21$

✳ $13s - 7t = -55$ ✳

$7(9s - 11t = -75)$     $63s - 77t = -525$
$(13s - 7t = -55)$ $\underline{-143s + 77t = 605}$
$_{-11}$
                    $-80s = 80$
                    $s = -1$

$9(-1) - 11t = -75$

$-9 - 11t = -75$

$-11t = -66$

$t = 6$

$-r + 2(-1) - 2(6) = -19$

$-r - 2 - 12 = -19$

$-r - 14 = -19$

$-r = -5$

$r = 5$

$\boxed{(5, -1, 6)}$

② $x - 4y + 4z = 25$
  $x - 6y + 4z = 27$
  $-3x - 2y - 4z = -29$
  $(5, -1, 4)$