HW 3-4

$\max z = -x_1 + 3x_2 - 3x_3$

s.t.

$s_1 = 7 - 3x_1 + x_2 + 2x_3$

$s_2 = 3 + 2x_1 + 4x_2 - 4x_3$

$s_3 = 4 - x_1 + 2x_3$

$s_4 = 8 + 2x_1 - 2x_2 - x_3$

$s_5 = 5 - 3x_1$

$x_1, x_2, x_3, s_1, s_2, s_3 \geq 0$

pivot on x_2

$(x_1, x_2, x_3, s_1, s_2, s_3, s_4, s_5) = (0, 0, 0, 7, 3, 4, 8, 5)$

$\exists\ x_2 \leq 4 \exists\ x_2 = 4 + x_1 - \frac{1}{2}x_3 - \frac{1}{2}s_4$

$\max z = 12 + 2x_1 - \frac{9}{2}x_3 - \frac{3}{2}s_4$

s.t.

$s_1 = 11 - 2x_1 + \frac{3}{2}x_3 - \frac{1}{2}s_4$

$s_2 = 19 + 6x_1 - 6x_3 - 2s_4$

$s_3 = 4 - x_1 + 2x_3$

$x_2 = 4 + x_1 - \frac{1}{2}x_3 - \frac{1}{2}s_4$

$s_5 = 5 - 3x_1$

$x_1, x_2, x_3, s_1, s_2, s_3, s_4, s_5 \geq 0$

pivot on x_1

$\exists\ x_1 \leq \frac{11}{2}$

$\exists\ x_1 \leq 4$

$\exists\ x_1 \leq \frac{5}{3} \exists\ x_1 = \frac{5}{3} - \frac{1}{3}s_5$

$x_1 = 0 \quad s_4 = 0$

$x_2 = 4 \quad s_5 = 5$

$x_3 = 0$

$s_1 = 11$

$s_2 = 19$

$s_3 = 4$

$\max z = \frac{46}{3} - \frac{2}{3}s_5 - \frac{9}{2}x_3 - \frac{3}{2}s_4$

s.t.

$s_1 = \frac{23}{3} + \frac{2}{3}s_5 + \frac{3}{2}x_3 - \frac{1}{2}s_4$

$s_2 = 29 - 2s_5 - 6x_3 - 2s_4$

$s_3 = \frac{7}{3} + \frac{1}{3}s_5 + 2x_3$

$x_2 = \frac{17}{3} - \frac{1}{3}s_5 - \frac{1}{2}x_3 - \frac{1}{2}s_4$

$x_1 = \frac{5}{3} - \frac{1}{3}s_5$

$x_1, x_2, x_3, s_1, s_2, s_3, s_4, s_5 \geq 0$

$\therefore \max z = \frac{46}{3}$ //

$(x_1, x_2, x_3, s_1, s_2, s_3, s_4, s_5) = (\frac{5}{3}, \frac{17}{3}, 0, \frac{23}{3}, 29, \frac{7}{3}, 0, 0)$

HW3-5

Before adding x_0

(x_1, x_2, s_1, s_2)

$= (0, 0, 10, -2)$

$\max\{-x_0\}$, $\max z = 2x_1 + x_2$

s.t. (pivot on x_0)

$\Rightarrow$ $s_1 = x_0 + 10 - x_1 - x_2$

$s_2 = x_0 - 2 - x_1 + x_2 \Rightarrow x_0 = 2 + s_2 + x_1 - x_2$

$x_0, x_1, x_2, s_1, s_2 \geq 0$

$\Rightarrow \max\{-2 - s_2 - x_1 + x_2\}$, $\max z = 2x_1 + x_2$

s.t. (pivot on x_2)

$s_1 = 12 + s_2 - 2x_2$

$x_0 = 2 + s_2 + x_1 - x_2 \Rightarrow x_2 = 2 - x_0 + x_1 + s_2$

$x_0, x_1, x_2, s_1, s_2 \geq 0$

$\Rightarrow \max\{-x_0\}$, $\max z = 2 - x_0 + 3x_1 + s_2$

s.t.

$s_1 = 8 - x_0 - 2x_1 - s_2$

$x_2 = 2 + x_0 + x_1 + s_2$

$x_0, x_1, x_2, s_1, s_2 \geq 0$

$\therefore \max\{-x_0\} = 0$

set $x_0 = 0$ $\Rightarrow$ $\max z = 2 + 3x_1 + s_2$

s.t. (pivot on x_1)

$s_1 = 8 - 2x_1 - s_2 \Rightarrow x_1 = 4 - \frac{1}{2}s_1 - \frac{1}{2}s_2$

$x_2 = 2 + x_1 + s_2$

$x_1, x_2, s_1, s_2 \geq 0$

(x_1, x_2, s_1, s_2)

$= (0, 2, 8, 0)$

$\Rightarrow \max z = 14 - \frac{3}{2}s_1 - \frac{5}{2}s_2$

s.t. $x_1 = 4 - \frac{1}{2}s_1 - \frac{1}{2}s_2$

$x_2 = 6 - \frac{1}{2}s_1 + \frac{1}{2}s_2$

$x_1, x_2, s_1, s_2 \geq 0$

$\therefore \boxed{\max z = 14}$ //

(x_1, x_2, s_1, s_2)

$= (4, 6, 0, 0)$