HW4-2

$$\min z = 2x_1 + 3x_2 + 4x_3$$

s.t.

$$x_1 - x_2 + x_3 \geq 10$$
$$x_1 - 2x_2 + 3x_3 \geq 6$$
$$3x_1 - 4x_2 + 5x_3 \geq 15$$
$$x_1, x_2, x_3 \geq 0$$

$\Rightarrow$

$$\max\{-z\} = -2x_1 - 3x_2 - 4x_3$$

s.t.

$$s_1 = -10 + x_1 - x_2 + x_3 \Rightarrow \text{pivot } s_1, \quad \min\left\{\underset{\checkmark}{\frac{-2}{-1}}, \frac{-4}{-1}\right\}$$
$$s_2 = -6 + x_1 - 2x_2 + 3x_3$$
$$s_3 = -15 + 3x_1 - 4x_2 + 5x_3$$
$$x_1, x_2, x_3, s_1, s_2, s_3 \geq 0$$

Dual simplex

$$\Rightarrow \max\{-z\} = -20 - 2s_1 - 5x_2 - 2x_3$$

s.t.

$$x_1 = 10 + s_1 + x_2 - x_3$$
$$s_2 = 4 + s_1 - x_2 + 2x_3$$
$$s_3 = 15 + 3s_1 - x_2 + 2x_3$$
$$x_1, x_2, x_3, s_1, s_2, s_3 \geq 0$$

$(s_1, x_2, x_3) = (0, 0, 0)$ is feasible

$\Rightarrow$ optimal solution:

$x_1 = 10$

$x_2 = 0$

$x_3 = 0$

$s_1 = 0$

$s_2 = 4$

$s_3 = 15$

$z_s = \min\{z\} = 20$ #