

$$② \max 2x_1 - 6x_2 + 0x_3$$

$$\exists -x_1 - x_2 - x_3 \leq -2$$

$$2x_1 - x_2 + x_3 \leq 1$$

$$\max -(-2+\mu)x_1 - (6+\mu)x_2 - (0+\mu)x_3 = 2$$

$$\geq x_4 = -2 + \mu + x_1 + x_2 + x_3 \rightarrow \text{unbdd}$$

$$x_5 = 1 + \mu - 2x_1 + x_2 - x_3 \rightarrow x_1 \leq \frac{3}{2}$$

$$\mu \geq 2$$

$$\mu \geq 2$$

$$\mu \geq -6$$

$$\mu \geq -1$$

$$\rightarrow \mu \geq -1 \rightarrow n=2 \rightarrow x_1 \text{ enters}$$

$$\mu \geq 0$$

x_1 enters, x_5 leaves

$$\max -(-2+\mu)x_1 - (6+\mu)x_2 - (0+\mu)x_3$$

$$\geq x_4 = -2 + \mu + x_1 + x_2 + x_3$$

$$x_1 = \gamma_1(1+\mu) + \gamma_2 x_2 - \gamma_2 x_3 - \gamma_2 x_5$$

$$\max -(-2+\mu)(\gamma_1(1+\mu) + \gamma_2 x_2 - \gamma_2 x_3 - \gamma_2 x_5) - (6+\mu)x_2 - (0+\mu)x_3$$

$$\geq x_4 = -2 + \mu + \gamma_1(1+\mu) + \gamma_2 x_2 - \gamma_2 x_3 - \gamma_2 x_5 + x_2 + x_3$$

$$x_1 = \gamma_1(1+\mu) + \gamma_2 x_2 - \gamma_2 x_3 - \gamma_2 x_5$$

$$\max -(-2+\mu)(\gamma_1(1+\mu))$$

$$-(-1+\gamma_2\mu)x_2 - (1-\gamma_2\mu)x_3 - (1-\gamma_2\mu)x_5 - (6+\mu)x_2 - (0+\mu)x_3$$

$$\geq x_4 = -3\gamma_2 + 3\gamma_2\mu + \gamma_2 x_2 + \gamma_2 x_3 - \gamma_2 x_5$$

$$x_1 = \gamma_1(1+\mu) + \gamma_2 x_2 - \gamma_2 x_3 - \gamma_2 x_5$$

$$\max -(-2 + \mu)(y_2 + \frac{1}{2}\mu)$$

$$-(5 + \frac{3}{2}\mu)x_2 - (1 + \frac{1}{2}\mu)x_3 - (1 - \frac{1}{2}\mu)x_5$$

$$\Rightarrow x_4 = -\frac{3}{2} + \frac{3}{2}\mu + \frac{3}{2}x_2 + y_2x_3 - y_2x_5$$

$$x_1 = y_1 + \frac{1}{2}\mu + \frac{1}{2}x_2 - y_2x_3 - y_2x_5$$

$$5 + \frac{3}{2}\mu \geq 0 \quad \checkmark \quad -\frac{3}{2} + \frac{3}{2}\mu \geq 0 \rightarrow \mu \geq 1$$

$$1 + \frac{1}{2}\mu \geq 0 \quad \checkmark \quad y_2 + \frac{1}{2}\mu \geq 0 \quad \rightarrow \mu = 1$$

$$1 - \frac{1}{2}\mu \geq 0 \rightarrow \mu \leq 2 \quad \checkmark \quad \rightarrow x_4 \text{ leaves}$$

Dual ratio test

$$(1) -\frac{3}{2}z_4 - (1)$$

$$z_2 \leq \frac{1}{2} - \frac{3}{2}z_4 + (1) \rightarrow z_2 \leq \frac{1}{2}$$

$$z_3 = \frac{3}{2} - \frac{1}{2}z_4 + (1) \rightarrow z_4 \leq 3 \rightarrow x_3 \text{ enters}$$

$$z_5 = \frac{1}{2} + \frac{1}{2}z_4 + (1) \rightarrow \text{unbdd}$$

x_3 enters x_4 leaves

$$\max -(-2 + \mu)(y_2 + \frac{1}{2}\mu)$$

$$-(5 + \frac{3}{2}\mu)x_2 - (1 + \frac{1}{2}\mu)x_3 - (1 - \frac{1}{2}\mu)x_5$$

$$\Rightarrow x_3 = 3 - 3\mu - 3x_2 + 2x_4 + x_5$$

$$x_1 = y_1 + \frac{1}{2}\mu + \frac{1}{2}x_2 - y_2x_3 - y_2x_5$$

$$\max -(-2 + \mu)(y_2 + \frac{1}{2}\mu)$$

$$-(5 + \frac{3}{2}\mu)x_2 - (1 + \frac{1}{2}\mu)(3 - 3\mu - 3x_2 + 2x_4 + x_5) - (1 - \frac{1}{2}\mu)x_5$$

$$\Rightarrow x_3 = 3 - 3\mu - 3x_2 + 2x_4 + x_5$$

$$x_1 = y_1 + \frac{1}{2}\mu + \frac{1}{2}x_2 - y_2(3 - 3\mu - 3x_2 + 2x_4 + x_5) - y_2x_5$$

$$\max - (-2 + \mu)(1_2 + 1_3\mu) - (1 + 1_2\mu)(3 - 3\mu)$$

$$- (5 + 3\mu)x_2 - (-3 - 3x_1)x_2 - (2 + \mu)x_4 - (1 + 1_2\mu)x_5 - (1 - 1_2\mu)x_5$$

$$\geq x_3 = 3 - 3\mu - 3x_2 + 2x_4 + x_5$$

$$x_1 = -1 + 2\mu + 2x_2 - x_4 - x_5$$

$$\max - (-2 + \mu)(1_2 + 1_3\mu) - (1 + 1_2\mu)(3 - 3\mu)$$

$$-2\bar{x}_2 - (\bar{2} + \bar{\mu})\bar{x}_4 - \bar{2}\bar{x}_5$$

$$\geq x_3 = 3 - 3\bar{\mu} - 3\bar{x}_2 + 2\bar{x}_4 + \bar{x}_5$$

$$x_1 = -1 + 2\bar{\mu}^0 + 2\bar{x}_2 - \bar{x}_4 - \bar{x}_5$$

$$\text{unbd} \vee 3 - 3\mu \geq 0 \rightarrow \mu \leq 1 \vee$$

$$2 + \mu \geq 0 \vee -1 + 2\mu \geq 0 \rightarrow \mu \geq 1_2 \rightarrow \mu = 1_2$$

$$1 + 1_2\mu \geq 0 \vee \rightarrow x_1 \text{ leaves}$$

Dual ratio test

$$(m) - 0z_1 + (\infty)$$

$$z_2 = 2 - 2z_1 \rightarrow z_1 \leq 1$$

$$z_4 = \frac{5}{2} + z_1 \rightarrow \text{unbd} \rightarrow x_2 \text{ enters}$$

$$z_5 = 2 + z_1 \rightarrow \text{unbd}$$

$$\max - (-2 + \mu)(1_2 + 1_3\mu) - (1 + 1_2\mu)(3 - 3\mu)$$

$$-2x_2 - (2 + \mu)x_4 - 2x_5$$

$$\geq x_3 = 3 - 3\mu - 3x_2 + 2x_4 + x_5$$

$$x_2 = 1_2 - \mu + 1_2x_1 + 1_2x_4 + 1_2x_5$$

$$\max -(-2+\mu)(1_2 + \frac{1}{2}\mu) - (1 + \frac{1}{2}\mu)(3 - 3\mu)$$

$$-2(1_2 - \mu + 1_2 x_1 + \frac{1}{2}x_4 + \frac{1}{2}x_5) - (2+\mu)x_4 - 2x_5$$

$$\begin{aligned} \Rightarrow x_3 &= 3 - 3\mu - 3(1_2 - \mu + 1_2 x_1 + \frac{1}{2}x_4 + \frac{1}{2}x_5) + 2x_4 + x_5 \\ x_2 &= 1_2 - \mu + 1_2 x_1 + \frac{1}{2}x_4 + \frac{1}{2}x_5 \end{aligned}$$

$$\max -(-2+\mu)(1_2 + \frac{1}{2}\mu) - (1 + \frac{1}{2}\mu)(3 - 3\mu)$$

$$-1 + 2\mu - x_1 - x_4 - x_5 - (2+\mu)x_4 - 2x_5$$

$$\begin{aligned} \Rightarrow x_3 &= 3 - 3\mu - 3_2 + 3\mu - 3_2 x_1 - 3_2 x_4 - 3_2 x_5 + 2x_4 + x_5 \\ x_2 &= 1_2 - \mu + 1_2 x_1 + \frac{1}{2}x_4 + \frac{1}{2}x_5 \end{aligned}$$

$$\max -(-2+\mu)(1_2 + \frac{1}{2}\mu) - (1 + \frac{1}{2}\mu)(3 - 3\mu) - 1 + 2\mu$$

$$-x_1 - (3+\mu)x_4 - 3x_5$$

$$\Rightarrow x_3 = 3_2 - 3_2 x_1 + \frac{1}{2}x_4 - \frac{1}{2}x_5$$

$$x_2 = 1_2 - \mu + 1_2 x_1 + \frac{1}{2}x_4 + \frac{1}{2}x_5$$

unbdd

$$3+\mu \geq 0 \checkmark$$

unbdd

unbdd

$$1_2 - \mu \geq 0 \rightarrow \mu \in 1_2 \checkmark \rightarrow \mu = 0$$

$$\max -3 - x_1 - (3+\mu)x_4 - 3x_5$$

$$\Rightarrow x_3 = 3_2 - 3_2 x_1 + \frac{1}{2}x_4 - \frac{1}{2}x_5$$

$$x_2 = 1_2 + 1_2 x_1 + \frac{1}{2}x_4 + \frac{1}{2}x_5$$

$$x_1, x_4, x_5 \leq 0$$

$$x_2 = 1_2$$

$$y = -3$$

$$x_3 = 3_2$$