

Problems with degeneracy

① Pivot without improving

② Cycling. (never get to optimal)

$$\max z = 2x_1 + 3x_2 - x_3 - 12x_4$$

$$\text{s.t.} \quad -2x_1 - 9x_2 + x_3 + 9x_4 \leq 0$$

$$\frac{1}{3}x_1 + x_2 - \frac{x_3}{3} - 2x_4 \leq 0$$

$$x_1, x_2, x_3, x_4 \geq 0$$

$$z \quad x_1 \quad x_2 \quad x_3 \quad x_4 \quad s_1 \quad s_2 \quad | \quad \text{Rhs}$$

$$1 \quad -2 \quad -3 \quad 1 \quad 12 \quad 0 \quad 0 \quad | \quad 0$$

$$0 \quad -2 \quad -9 \quad 1 \quad 9 \quad 1 \quad 0 \quad | \quad 0 \quad \frac{0}{-9} = \infty$$

$$0 \quad \frac{1}{3} \quad 1 \quad -\frac{1}{3} \quad -2 \quad 0 \quad 1 \quad | \quad 0 \quad \frac{0}{1} = 0$$

$$-1 \quad -1 \quad 0 \quad 0 \quad 6 \quad 0 \quad 3 \quad | \quad 0$$

$$0 \quad 1 \quad 0 \quad -2 \quad -9 \quad 1 \quad 9 \quad | \quad 0 \quad \frac{0}{1} = 0$$

$$0 \quad \frac{1}{3} \quad 1 \quad -\frac{1}{3} \quad -2 \quad 0 \quad 1 \quad | \quad 0 \quad \frac{0}{\frac{1}{3}} = 0$$

$$1 \quad 0 \quad 0 \quad -2 \quad -3 \quad 1 \quad 12 \quad | \quad 0$$

$$0 \quad 1 \quad 0 \quad -2 \quad -9 \quad 1 \quad 9 \quad | \quad 0 \quad \frac{0}{-9} = \infty$$

$$0 \quad 0 \quad 1 \quad \frac{1}{3} \quad 1 \quad -\frac{1}{3} \quad -2 \quad | \quad 0 \quad \frac{0}{1} = \infty$$

$$1 \quad 0 \quad 3 \quad -1 \quad 0 \quad 0 \quad 6 \quad | \quad 0$$

$$0 \quad 1 \quad 9 \quad 1 \quad 0 \quad -2 \quad -9 \quad | \quad 0$$

$$0 \quad 0 \quad 1 \quad \frac{1}{3} \quad 1 \quad -\frac{1}{3} \quad -2 \quad | \quad 0 \quad \frac{0}{1} = 0$$

$$1 \quad 1 \quad 12 \quad 0 \quad 0 \quad -2 \quad -3 \quad | \quad 0$$

$$0 \quad 1 \quad 9 \quad 1 \quad 0 \quad -2 \quad -9 \quad | \quad 0$$

$$0 \quad -\frac{1}{3} \quad -2 \quad 0 \quad 1 \quad \frac{1}{3} \quad 1 \quad | \quad 0 \quad -\frac{0}{2} = \infty$$

Z	x_1	x_2	x_3	x_4	s_1	s_2	Rhs
1	0	6	0	-3	-1	0	0
0	-2	-9	1	9	1	0	0
0	$-\frac{1}{3}$	-2	0	1	$\frac{1}{3}$	1	0

$\frac{0}{1} = 0$
 $\frac{0}{\frac{1}{3}} = 0$

1	-2	-3	1	12	0	0	0
0	-2	-9	1	9	1	0	0
0	$\frac{1}{3}$	1	$-\frac{1}{3}$	-2	0	1	0

Same as 1st tableau