

Linear Programs

CSCI 4113/6101



Linear Program

$$\text{Maximize } x + 2y$$

$$\text{s.t. } 3x + y \leq 26$$

$$4x - y \leq 31$$

$$2y - x \leq 4$$

$$x, y \geq 0$$

Linear Program

Maximize $x + 2y$

← Linear objective function

s.t. $3x + y \leq 26$

$$4x - y \leq 31$$

$$2y - x \leq 4$$

$$x, y \geq 0$$

↑ ↑

Variables

} Linear constraints

Linear Program

Maximize $x + 2y$

← Linear objective function

s.t. $3x + y \leq 26$

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$$x, y \geq 0$$

↑ ↑
Variables

} Linear constraints

Goal: Assign values to all variables so that all constraints are satisfied and the objective function value is maximized.

Linear Program

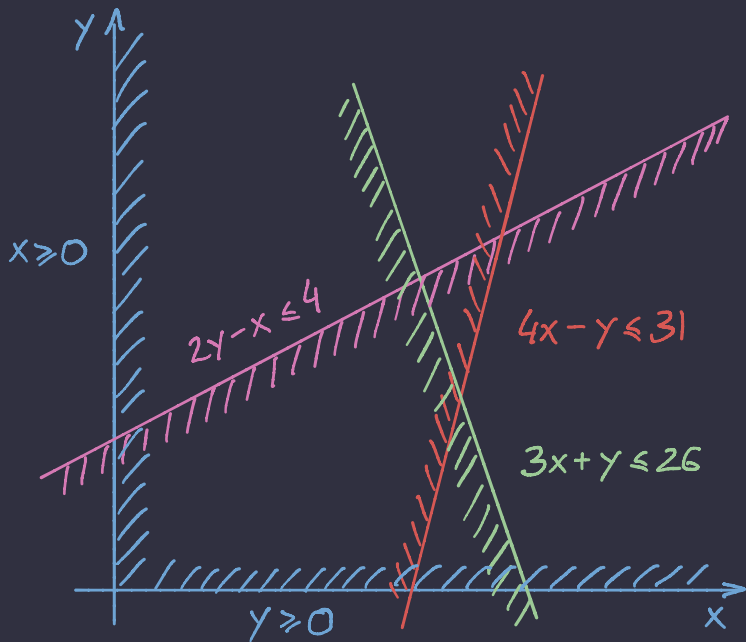
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Linear Program

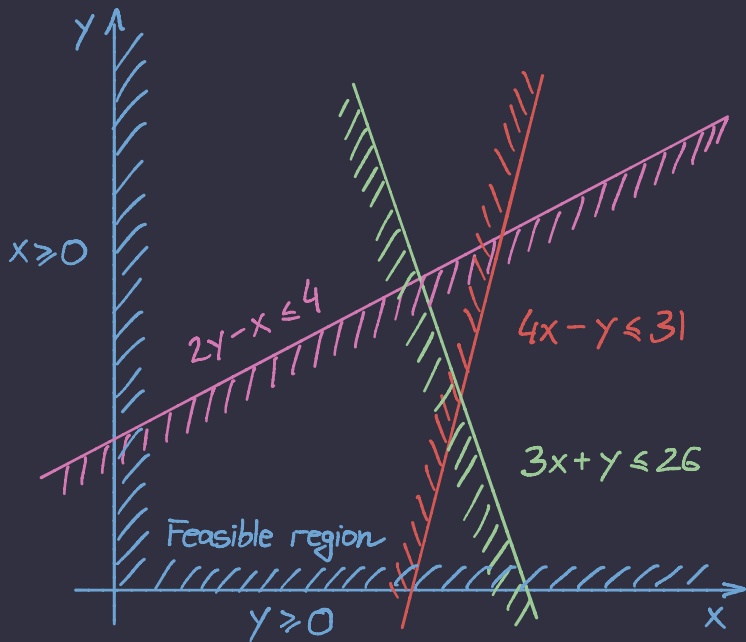
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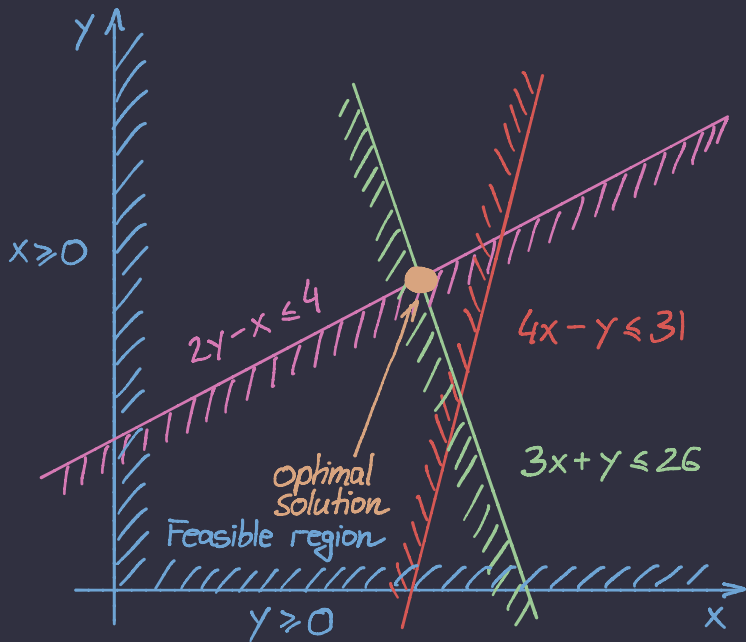
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Some Terminology

Maximize $x + 2y$

$$\text{s.t. } 3x + y \leq 26$$

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$$2y - x \leq 4$$

$$x, y \geq 0$$

Solution = assignment of values to variables

$$x = 1 \quad y = 3$$

Some Terminology

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Solution = assignment of values to variables

Feasible solution = solution that satisfies all constraints

$$x = 1 \quad y = 3$$

Some Terminology

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$$x = 1 \quad y = 2$$

Some Terminology

Maximize $x + 2y$

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Solution = assignment of values to variables

Feasible solution = solution that satisfies all constraints

Optimal solution = feasible solution with maximum objective function value

$$x = 1$$

$$y = 2$$

$$x + 2y = 5$$

Some Terminology

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Optimal solution = feasible solution with maximum objective function value

$$x = \frac{34}{7}$$

$$y = \frac{30}{7}$$

$$x + 2y = \frac{98}{7} = 14$$