

# Optimization Mid1

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## 1 Programs

### 1.1 Generic problem

Minimize objective function  $f : S \subseteq \mathbb{R}$  that maps set of feasible solutions  $S$  to an output.

$$\begin{array}{ll} \min & f(x) \\ \text{s.t.} & x \in S \end{array}$$

### 1.2 Canonical form

$$\begin{array}{ll} \min & c_1x_1 + \dots c_nx_n \\ \text{s.t.} & \mathbf{Ax} \geq \mathbf{b} \\ & \mathbf{x} \geq \mathbf{0} \end{array}$$

### 1.3 Standard form

$$\begin{array}{ll} \min & c_1x_1 + \dots c_nx_n \\ \text{s.t.} & \mathbf{Ax} = \mathbf{b} \\ & \mathbf{x} \geq \mathbf{0} \end{array}$$

### 1.4 Converting between forms

1. Between min and max: negate objective function costs and objective function value.

$$\min f(\mathbf{c}, \mathbf{x}) = \max -f(\mathbf{c}, \mathbf{x})$$

2. Between greater than or equal to for constraints:

$$\mathbf{Ax} \leq \mathbf{b} \iff -\mathbf{Ax} \geq -\mathbf{b}$$