SFWR ENG 4O03

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Contents

Linear

Linear Program: an optimization problem in which the objective function is linear and each constraint is a linear inequality or equality
Decision variables: describe our choices that are under our control
Objective function: describes a criterion that we wish to max/minimize; doesn't have an in/equality
e.g. max 40x + 30y
Constraints: describe the limitations that restrict our choices for our decision variables, always *inequalities*.

Converting constraints to equalities

Slack variable: equation variable greater than constraint, added
Surplus variable: equation variable less than constraint, subtracted

Hyperplane: a hyperplane in R^x is a shape in R^{x-1}, e.g. line in R^2

Optimal Solution:

Standard form: when you take inequalities and use slack variables to turn them into equalities.

- Note: all variables need to be ≥ 0.
- All remaining constraints are expressed as equality constraints.

e.g.)

$2x_1 + 4x_2 - x_3 - x_4 \quad \geq 1$
$2x_1 + 4x_2 - x_3 - x_4 + s \quad = 1$

Simplex Method

Simplex Method: useful for solving linear optimization problems cheaply

- Cannot be done with **strict inequalities**, i.e. when there is no possibility of being equal
- Can only work if your objective function is in *standard form*

Simplex Tableau: visual representation of stuff