

## CSE 291-A Homework 1

**Due Time : 11:59pm, Monday Oct 9, 2017 Submit to Gradescope**  
**Gradescope:** <https://gradescope.com/>

In this homework assignment, we work on convex set examples including Voronoi Diagram, positive semidefinite matrices, and dual cones. The first four exercises worth 1 point each (graded by completion). The last two worth 3 points each (graded by content). Thus, the total points are 10.

**I Exercises from textbook chapter 2:** 2.9, 2.28, 2.31, 2.32

### II Assignments

II.1 [Polyhedron Example] Given a sphere in the first octant of  $\mathbb{R}^3$ . The sphere is centered at  $(r, r, r)$  and its radius is equal to  $r$ . Find a polyhedron,  $\{x | Ax \leq b\}$ , where matrix  $A \in \mathbb{R}^{4 \times 3}$ , vector  $x \in \mathbb{R}^3$ , that contains the sphere with a minimum volume.

II.2 [Convex space Conversion]

$$\begin{cases} 2x + y \leq 6 \\ -2x - 3y \leq -6 \\ -x + 2y \leq 4 \end{cases} \quad (1)$$

Find the matrix  $V$  such that  $\{V\theta | \sum \theta_i = 1, \theta_i \geq 0\}$ , has the equivalent solution set as above.