1

The solution sets of linear equation below is?

$$\begin{cases} 2x_1 - 3x_2 + 5x_3 = -1 \\ x_1 + x_2 - 2x_3 = 2 \end{cases}$$

- Convex set and not Affine set
- *Affine set and not convex*
- *Affine and Convex* ✓

2

The set of the form below is ?

$\{x : a^T x = b\}$, $a \neq 0$

- *Convex set*
- *Affine set*
- *Affine and Convex* ✓

✓ **Correct** 1/1 Points

3

The set of the form as below is called?

$\{x : a^T x \leq b\}$, $a \neq 0$

- *Halfspace* ✓
- *Hyperplane*
- *Cone*

4

Is the union of two convex sets again convex?

- *Yes*
- *No* ✓

✓ **Correct** 1/1 Points

5

The function below are convex?

$f(x) = \ln(e^{x_1} + \ldots + e^{x_n})$

- *Yes* ✓
- *No*

6

Does the statement true or false?

Let $f:\mathbb{R}^n \to \mathbb{R}$ be a differentiable function. f is convex over a nonempty convex set C if and only if

$$\left(\nabla f(x)-\nabla f(y)\right)^T (x-y)\geq 0 \quad \forall x,y\in C$$

- True ✓
- False

7

What type of set C as below set?

Let $A \in \mathbb{R}^{m \times n}$ and consider the set $C = \{x \in \mathbb{R}^n : Ax \leq 0\}$.

- *C is not convex*
- *C is cone*
- *C is convex cone* ✓

8

Question

Is the unit ball $B = \{x \in \mathbb{R}^n : \|x\|_2 \leq 1\}$ *a polyhedron?*

- *Yes*
- *No* ✓

10

Question

Let $S = \{(0,0),(1,0),(0,1)\}$. Determine the convex hull of S.

a. $\text{conv}(S) = \{(x_1, x_2) \in \mathbb{R}^2 : x_1 \leq 0, x_2 \leq 0, x_1 + x_2 \leq 1\}$

b. $\text{conv}(S) = \{(x_1, x_2) \in \mathbb{R}^2 : x_1 \geq 0, x_2 \geq 0, x_1 + x_2 \geq 1\}$

c. $\text{conv}(S) = \{(x_1, x_2) \in \mathbb{R}^2 : x_1 \geq 0, x_2 \geq 0, x_1 + x_2 \leq 1\}$

- *a*
- *b*
- *c* ✓