Blank Quiz

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AC + b is convex!

If C is a convex set, $C \subseteq \mathbb{R}^n$, $A \in \mathbb{R}^{mxn}$, $b \in \mathbb{R}^m$, then

$$AC + b = \{Ax + b | x \in C\} \subseteq \mathbb{R}^m$$

- ○ True
- ○ False

Let x be a $n -$ length vector and x_i is the i^{th}entry of x.

The set C is defined as $C = \{x : \left(\sum_{i=1}^{n} |x_i|^p\right)^{1/p} \leq 1\}$. Then C is ?

- ○ Convex (always)
- ○ Not convex
- ○ Convex when p>= 0
- ○ Convex when p>= 1

Which of the following are true?

- ☐ Intersection of half spaces is convex
- ☐ Union of half spaces is convex
- ☐ Simplex is a polyhedron
- ☐ Polyhedron is a simplex

X is convex!

$X = \{(x, y) : y \geq -x^2, x \in \mathbb{R}\}$

- ○ True
- ○ False

1.Which of the following sets is convex?
a)$\{(x,y) \in R^2/xy \geq 1, x \geq 0, y \geq 0\}$
b)$\{(x,y) \in R^2/xy \geq 1\}$
c)$\{(x,y) \in R^2/xy \leq 1, x \geq 0, y \geq 0\}$

- ○ a
- ○ b
- ○ c

Equivalent representation of a norm ball of radius r and center $\bar{\mathbf{x}}_c$ is

$S = \{\bar{\mathbf{x}}_c + r\bar{\mathbf{u}}|\ ||\bar{\mathbf{u}}|| \leq 1\}$

○ Option 1

$S = \{\bar{\mathbf{x}}_c + r\bar{\mathbf{u}}\}$

○ Option 2

$S = \{\bar{\mathbf{x}}_c + r\bar{\mathbf{u}}|\ ||\bar{\mathbf{u}}|| = 1\}$

○ Option 3

$S = \{r\bar{\mathbf{x}}_c + \bar{\mathbf{u}}|\ ||\bar{\mathbf{u}}|| \leq 1\}$

○ Option 4

If C is an affine set, y ∈ C and x ∈ C, then set V = C−y = { x−y | x ∈ C } is

- ○ Affine
- ○ Convex
- ○ Subspace
- ○ All of the above

Which operation does not preserve convexity always

- ○ Intersection
- ○ Union
- ○ Affine map
- ○ Projection

2.The closed line segment between (1,1) and(1,1)can be written as the set.
a)$\{(x,y) \in R^2/(x, y) = (2\gamma - 1, 2\gamma - 1), \forall\gamma \in [0, 1]\}$
b) $\{(x,y) \in R^2/(x, y) = (\gamma, 1 - \gamma), \forall\gamma \in [0, 1]\}$
c)$\{(x,y) \in R^2/x = y\}$

- ○ a
- ○ b
- ○ c

Let C, C_1 , and C_2 be convex sets in ℝ^n and let β ∈ ℝ then

(a) $\beta C := \{z \in \mathbb{R}^n \,|\, z = \beta x, x \in C\}$ *is convex.*

(b) $C_1 + C_2 := \{z \in \mathbb{R}^n \,|\, z = x_1 + x_2, x_1 \in C_1, x_2 \in C_2\}$ *is convex.*

- ○ Only A is True
- ○ Only B is True
- ○ Both A and B are True
- ○ Both A and B are False

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