Sets		
Set	Convex?	Proof
$C = A \cup B$	Not always	
$C = A \cap B$	Yes, if A and B are convex sets.	

Functions		
Function	Convex?	Proof
$\mathbf{y} = \max(f_1, f_2)$	Yes, if f_1 and f_2 are convex functions	
$\mathbf{y} = \min(f_1, f_2)$	Not always	
$C = \{\mathbf{x} \in \mathbb{R}^n \mid \mathbf{Ax} = \mathbf{b}, \mathbf{A} \in \mathbb{R}^{m \times n}, \mathbf{b} \in \mathbb{R}^m\}$	It is an affine set (all affine set is a convex set)	
$y = \mathbf{c}^\intercal \mathbf{x}$ (linear function)	Yes (but not strictly convex)	
$y = \left\|\mathbf{x}\right\|_p$ (p-norm)	Yes (for any $p \in \mathbb{N}_+$)	$\left\|\theta\mathbf{x} + (1-\theta)\mathbf{y}\right\| \leq \theta \left\|\mathbf{x}\right\| + (1-\theta) \left\|\mathbf{y}\right\|$ (triangular inequality)
$f(g(\mathbf{x}))$	Yes, if f, g are convex	

Function	Domain	Codomain	Comments
System of linear equation: $\mathbf{b} = f(\mathbf{x}) = \mathbf{Ax}$	$D = \{\mathbf{x} \in \mathbb{R}^n \mid \mathbf{Ax} = \mathbf{b} \in C, \mathbf{A} \in \mathbb{R}^{m \times n}\}$	$C = \{\mathbf{b} \in \mathbb{R}^m \vert \mathbf{b} = \mathbf{Ax}, \forall\, \mathbf{x} \in D\}$	If D is an affine set, so C is also affine set which, in turn, is a convex set.

Remarks:

1. All affine set is a convex set, but with infinite extension.

2. If the affine set happens to have the origin, it is also a subspace of that space.

3. An affine set contains every affine combination of its points: If C is an affine set, $x_1, \cdots, x_k \in C$, and $\sum_{i=1}^{k} \theta_i = 1$, then the point $\sum_{i=1}^{k} \theta_i x_1$ also belongs to C.