

Q2:

$$x, y \in L$$

$$L = \{x \in C : f(x) \leq \alpha\}$$

Prove

$$\lambda x + (1-\lambda)y \in L$$

$$x, y \in L \Rightarrow x, y \in C \quad f(x), f(y) \leq \alpha$$

$f$  is a convex function over  $C$ , therefore:

$$f(\lambda x + (1-\lambda)y) \leq \alpha \quad \lambda \in [0, 1]$$

and by definition of  $C$ :  $\lambda x + (1-\lambda)y \in C$

$\Downarrow$

$$\lambda x + (1-\lambda)y \in L$$