Convex Optimization Homework Solutions

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1 Homework 1

1.1 Exercise 2.1

Showing the definition of convexity for arbitrary k. $\theta_1 x_1 + \cdots + \theta_k x_k \in C$.

$$\theta_1 x_1 + \cdots + \theta_k x_k = \theta_1 x_1 + (1 - \theta_1)(\mu_2 x_2 + \mu_3 x_3 + \cdots + \mu_k x_k) \tag{1}$$

Where each $\mu_n = \frac{\theta_n}{1-\theta_1}$

$$\sum_i \mu_i = \frac{\sum_i \theta_i}{1 - \theta_1} = \frac{1 - \theta_1}{1 - \theta_1} = 1 \tag{2}$$

1.2 Exercise 2.2

1.3 Exercise 2.5

1.4 Exercise 2.7

1.5 Exercise 2.8

1.6 Exercise 2.11

1.7 Exercise 2.12

1.8 Exercise 2.15