

# Problem Set 6

(Duality Theory)

Due: Wednesday, April 11, 2018

**Problem 1: Exercise 6.1.1 of [Ber]**

**Problem 2: Exercise 6.1.2 of [Ber]**

**Problem 3: Exercise 6.3.4 of [Ber]**

## Problem 4

Consider the function

$$\Lambda^*(a) = \inf_{a_1, a_2 | a_1 + a_2 = a} [\Lambda_1^*(a_1) + \Lambda_2^*(a_2)],$$

where  $\Lambda_1^*(\cdot)$  and  $\Lambda_2^*(\cdot)$  are convex functions.

(a) Show that  $\Lambda^*(\cdot)$  is a convex function.

(b) Derive the convex conjugate of  $\Lambda^*(\cdot)$  as a function of the convex conjugates of  $\Lambda_1^*(\cdot)$  and  $\Lambda_2^*(\cdot)$ .