

**Problem Set 6**

(Duality Theory)

**Due: Thursday, April 14, 2016****Problem 1: Exercise 5.1.1 of [Ber]****Problem 2: Exercise 5.1.2 of [Ber]****Problem 3: Exercise 5.3.4 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  $\Lambda_2^*(\cdot)$ .