CS 525 - Fall 2015 - Homework 11

assigned 11/22/15 - due in class Friday 12/4/15

1. Verify that the conclusions of Corollary 7.1.3 hold for the function $f(x) = x^3$, where $f : R^1 \to R^1$.

2. Do Exercise 7-2-1.

3. (a) Use the Frank-Wolfe theorem to prove the following result: If the linear program

$$\min_x p^T x \ \text{ s.t. } \ Ax \geq b, x \geq 0,$$

   has a solution, then the convex quadratic program

$$\min_x \frac{1}{2} x^T Q x + p^T x \ \text{ s.t. } \ Ax \geq b, x \geq 0$$

   has a solution, for *any* positive semidefinite matrix Q.

   (b) Show (by giving a simple example in one variable) that the result of part (a) may not hold if Q has directions of negative curvature (that is, there are directions s such that $s^T Q s < 0$).

4. Do Exercise 7-3-1.