

**MA515 Homework #6**  
**Due Monday, October 17**

1. My course notes, problems 9.6, 9.7, 9.8, 9.12.
2. Consider the linear programs  $(P)$  and  $(P(u))$ :

$$\begin{array}{ll} \max c^T x & \max c^T x \\ \text{s.t. } Ax = b & \text{s.t. } Ax = b + u \\ x \geq O & x \geq O \\ (P) & (P(u)) \end{array}$$

Assume that  $(P)$  has an optimal objective function value  $z^*$ . Suppose that there exists a vector  $y^*$  and a positive real number  $\varepsilon$  such that the optimal objective function value  $z^*(u)$  of  $(P(u))$  equals  $z^* + u^T y^*$  whenever  $\|u\| < \varepsilon$ . Prove that  $y^*$  is an optimal solution to the dual of  $(P)$ .