

### Assignment #3a of Mathematical Programming

Deadline June 19, 2006

1. **Exercise 3.29:** Hint: Use the first order condition in Section 3.1.3 for each region  $\text{int } X_i$ .
2. **Exercise 3.28:** First read the proof in p.83 carefully. What argument does not necessarily hold when  $\text{dom } f \neq \mathcal{R}^n$ ? How is about the case where  $x$  lies in an open set?
3. **Vector composition:** Define  $f(x) := h(g_1(x), \dots, g_n(x))$  and

$$\text{dom } f := \{x \in \cap_{i=1}^n \text{dom } g_i \mid (g_1(x), \dots, g_n(x)) \in \text{dom } h\}.$$

Show that  $f$  is convex if  $h$  is convex,  $\tilde{h}$  is nondecreasing, and  $g$  is convex in each argument (see p.87 for the definition of a nondecreasing  $\tilde{h}$  in each argument).