Nonlinear Programming
Homework 3

Homework is due at the beginning of class on Friday, September 26.

1. Let $\Gamma$ be a nonempty convex set in $\mathbb{R}^n$, let $f$ and $g$ be respectively $m$-dimensional and $k$-dimensional convex vector functions on $\Gamma$. Obtain a theorem of the alternative of the type: Either

(I) $f(x) < 0$, $g(x) \leq 0$, has solution $x$ in $\Gamma$

or

(II) $\exists \ p \in \mathbb{R}^m$, $q \in \mathbb{R}^k$, ...... for any $x$ in $\Gamma$,

but not both.

Justify any additional assumptions that you make.

2. Suppose $f(x)$ is a convex function and $g(x)$ is a nondecreasing convex function. Prove that that the composite function $h(x) = g(f(x))$ is a convex function.