Homework 11

# Section 5.1

## Problem 7.

Show that, for any constant and , the set is convex.

Let and are points on the domain, and let , then we get that for , we can find a point that is in the domain . Now we know that:

Thus this point is in , thus the domain is convex.

## Problem 8.

Suppose the perturbation is proportional to , that is, for some constant . Show directly that the following initial-value problem is well-posed.

Theorem 5.3: Suppose is defined on a convex set . If a constant exists with

Then satisfies the Lipschitz condition on in the variable with Lipschitz constant ­.

Theorem 5.6: Suppose . If is continuous and satisfies a Lipschitz condition in the variable on the set , then the initial-value problem

Is well-posed.

This implies that this differential equation satisfies the Lipschitz condition. Since we know that is continuous in , then this differential equation is well-posed.