ENEE 664 Optimal Control

Homework Set 6 [due Monday March 31 2014]

1. Do the exercise on page 4 of Lecture Notes 5(a). Does one need a stronger property of UNIFORM continuity on $\frac{\partial g}{\partial x}(x,t)$ than the one stated in the exercise? Or, does such uniform continuity follow from the plain continuity assumption? [Read up on UNIFORM CONTINUITY]

2. Do the exercise on page 7 of Lecture Notes 5(b). Use the hint given there.

This pertains to Theorem 2 on page 6 of the same set of notes —

'typos'

In the 5th line from bottom : 'm' should be 'n'

" " 4th " " " : 'n' should be 'm' and 'm' should be 'n'.

3. Let $X = \{ x(\cdot) : [0,1] \to \mathbb{R}^2 \mid x(t) \text{ continuously differentiable in } t \}$

Let $g : X \to \mathbb{R}$, $g(x) = \int_0^1 (x_1 \dot{x}_2 - x_2 \dot{x}_1)\, dt$.

Let $\Omega = \{ x(\cdot) \in X \mid g(x) = 0 ;\ x_i(0) = x_i(1) = 0,\ i = 1,2 \}$

For a suitable norm on $X$, determine conditions for $x \in \Omega$ to be a <u>regular point</u>.

4. For given $A, B > 0$, and $a, b \in \mathbb{R}$, find (the) point in $\mathbb{R}^2$ that is closest to the origin and also lies on the ellipse,

$$\frac{(x-a)^2}{A^2} + \frac{(y-b)^2}{B^2} = 1.$$

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