ENEE 664 Spring 2019 HW 8

1. Read Chapter 2 (Liberti) up to and including section 2.9.2
2. Exercise 2.2 DL book
3. Exercise 2.5 DL book
4. Paulsen's Mylar balloon paper
   - justify transversality condition
5. Derive a calculus of variations formulation of the optimal control problem

\[ \ddot{x}_1 = v \cos(x_3); \quad \ddot{x}_2 = v \sin(x_3); \quad \ddot{x}_3 = u \]
\[ \min \int (u^2 + v^2) \, dt \]
subject to \( \dot{x}(0) \) and fixed end point conditions.

Then derive Euler Lagrange equation for this formulation. [HINT: There are 2 Lagrange multipliers]

6. Read P.D. Lax paper (1995) on "short path to shortest path"

7. Suppose the n x n matrix \( A = D + L + U \) (with diagonal part \( D \) and strict lower and upper triangular parts \( L \) and \( U \) respectively), is diagonally dominant:
\[ |a_{ii}| > \sum_{j \neq i} |a_{ij}| \quad i = 1, 2, \ldots, n. \]

Then show that \( T = D^{-1}(L+U) \) is a contraction map on all \( \mathbb{R}^n \). What if?