MATH3404, Assignment 4 (Due on 31 Oct 2014)
Submission: At the Assignment Box
on Level 4 of the Priestley Building 67.

Question 1. *(3 marks)Solve the problem of time-optimal control to the origin for the system*

$$\dot{x}_1 = 3x_1 + x_2$$
$$\dot{x}_2 = 4x_1 + 3x_2 + u,$$

where $|u| \leq 1$.

Question 2. *(4 marks) Solve the problem of time-optimal control to the origin for the system*

$$\dot{x}_1 = 2x_2, \quad \dot{x}_2 = -2x_1 + 4u, \ \ where \ |u| \leq 1.$$

Question 3. *(3 marks)*

The system $\dot{x} = -x + u$, where $u = u(t)$ is not subject to any constraint, is to be controlled from $x(0) = 1$ in such as way that

$$J = \frac{1}{2}x^2(2) + \frac{1}{2}\int_0^2 \left(u^2 - 2xu\right) dt$$

is minimized. Find the optimal control.