

Problem Sheet 8  
DRE 7007 Mathematics

**Problems**

1. Solve the optimal control problem

$$\max \int_0^2 (3 - x^2 - u^2) dt$$

subject to  $\dot{x} = u$ ,  $x(0) = 1$ ,  $x(2) = 4$  when the control region  $U = \mathbb{R}$ .

2. Solve the optimal control problem

$$\max \int_0^T (x - \frac{1}{2}u^2) dt$$

subject to  $\dot{x} = u$ ,  $x(0) = x_0$  when the control region  $U = \mathbb{R}$ . Use the optimal pair  $(x^*, u^*)$  to compute the optimal value function

$$V(x_0, T) = \int_0^T (x^* - \frac{1}{2}(u^*)^2) dt$$

**Keep answers as short and to the point as possible. Answers must be justified.**