

EE 653 Optimal Control Theory HW1

Q1. Let $x \in C^2 [R, R]$ be a scalar valued function. Derive the EL equations for the following functional J :

$$J(x) = \int_0^{t_f} g(x, \dot{x}, \ddot{x}, t) dt \text{ with } x(0) = x_0, \dot{x}(0) = \dot{x}_0 \text{ and } x(t_f) = x_f, \dot{x}(t_f) = \dot{x}_f \text{ given.}$$

Q2. Let $x \in C^1 [R, R]$ be a scalar valued function. Find the extremals for the functional:

$$J(x) = \int_0^{t_f} \sqrt{1 + \dot{x}^2} dt \text{ where } x(0) = 2 \text{ and terminates on the curve } \theta(t) = -4t + 5.$$