Dynamic Optimization - Presentation exercise 3

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3.1

a)

We have the functional

$$J(x,t) = \int_{t_0}^{t_f} x_1^2 + x_1 x_2 + x_2^2 + x_3^2 dt \tag{1}$$

subject to the differential equation constraints

$$\dot{x}_1 = x_2 \tag{2}$$
$$\dot{x}_2 = x_3. \tag{3}$$

.

$$p = 2\dot{x} - 3x \tag{4}$$
$$\dot{p} = 2\ddot{x} - 3\dot{x} \tag{5}$$
$$\tag{6}$$

$$2\ddot{x} - 3\dot{x} = -(\dot{x} - x) + 2x - 2\dot{x} + 3x \tag{7}$$
$$2\ddot{x} - 3\dot{x} = -\dot{x} + x + 2x - 2\dot{x} + 3x \tag{8}$$
$$2\ddot{x} - 3\dot{x} = -3\dot{x} + 6x \tag{9}$$
$$2\ddot{x} = 6x \tag{10}$$
$$\ddot{x} = 3x \tag{11}$$