Name: Solutions

1. Let $x = (x_1, x_2, x_3)$. The vector y is determined from x according to

$$y_1 = x_1 - x_2$$
$$y_2 = x_2 - x_3$$
$$y_3 = x_3 - x_1$$

Determine a matrix A (where all entries of A are numbers) such that $y = Ax$.

$$A = \begin{bmatrix} 1 & -1 & 0 \\ 0 & 1 & -1 \\ -1 & 1 & 0 \end{bmatrix}$$

2. Suppose the 4-vector c gives the coefficients of a cubic polynomial $p(t) = c_1 + c_2 t + c_3 t^2 + c_4 t^3$. Express the conditions

$$p(0) + p'(0) = 0$$
$$p(1) + p'(1) = 0$$

as a set of linear equations of the form $Ac = b$. Give the sizes of A and b, as well as their entries.

$$p(0) = c_1 \qquad p'(0) = c_2$$

$$p(1) = c_1 + c_2 + c_3 + c_4$$

$$p'(1) = c_2 + 2c_3 + 3c_4$$

$$c_1 + c_2 = 0$$

$$c_1 + 2c_2 + 3c_3 + 4c_4 = 0$$

$$A = \begin{bmatrix} 1 & 1 & 0 & 0 \\ 1 & 2 & 3 & 4 \end{bmatrix}$$

$\uparrow$
2×4

$$b = \begin{bmatrix} 0 \\ 0 \end{bmatrix} \quad 2 \times 1$$