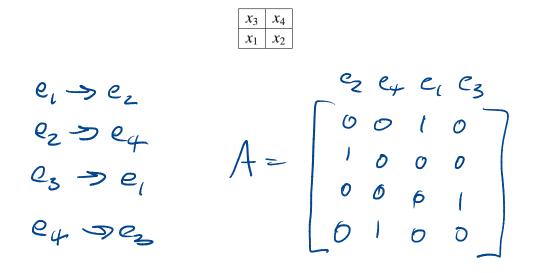
Name: Solutions

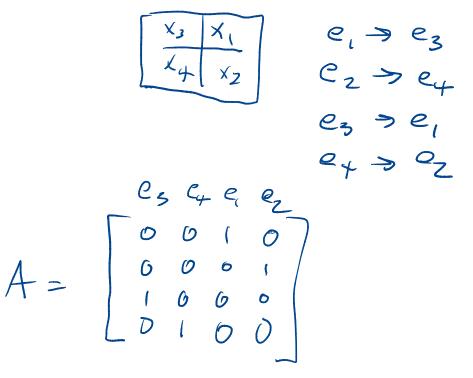
1. In this problem we represent a tiny 2×2 image by a vector $x = (x_1, x_2, x_3, x_4)$ of pixel intensities as follows:

x_1	<i>x</i> ₃
<i>x</i> ₂	<i>x</i> ₄

a) Determine the matrix A such that the function f(x) = Ax yields the image rotated by 90 degrees counterclockwise. That is, f(x) should correspond to the image:



b) Determine the matrix A such that the function f(x) = Ax yields the original image reflected left-right (as it would appear if viewed in a mirror).



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

$$p(0) = 1$$

 $p(1) = 2$
 $p'(0) = -p'(1)$

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

$$p(b) = 1 = 7 \quad (c_1 = 1)$$

$$p(1) = 2 = 7 \quad (c_1 + c_2 + c_3 + c_4 = 2)$$

$$p'(k) = c_1 + 2c_3 + 3c_4 + 3c_4$$