Name: Solutions

1. Compute the convolution $a * b$ where $a = (0.1, 0.3, 0.2)$ and where $b = (1, 0, 0, 0, 0, 0, 1)$.

$(0.1, 0.3, 0.2, 0, 0, 0, 0.1, 0.3, 0.2)$

2. In this problem we represent polynomials as a vector of coefficients. For example, $p(t) = c_1 + c_2 t + c_3 t^2$ is represented by the vector $c = (c_1, c_2, c_3)$.

Determine a matrix D such that if $p(t) = c_1 + c_2 t + c_3 t^2$ is a quadratic polynomial, then $d = Dc$ is the coefficients of the derivative polynomial $p'(t) = d_1 + d_2 t$.

$c_1 \to 0 \qquad (1,0,0) \to (0,0,1)$

$c_2 t \to c_2 \qquad (0,1,0) \to (1,0)$

$c_3 t^2 \to 2c_3 \qquad (0,0,1) \to (0,2)$

$$D = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 2 \end{bmatrix}$$