

# AMSC 660 Assignment 3

Jiaqi Leng

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## 1 Problem 1

Recall that Hermite polynomials are

$$H_0 = 1, H_1 = x, H_2 = x^2 - 1, H_3 = x^3 - 3x,$$

and  $P_3 = \text{Span}\{H_i\}_{0 \leq i \leq 3}$ ,  $P_2 = \text{Span}\{H_i\}_{0 \leq i \leq 2}$ , with  $L = \frac{d}{dx}$ .

$$L(H_0) = 0, \quad L(H_1) = 1 = H_0,$$

$$L(H_2) = 2x = 2H_1, \quad L(H_3) = 3x^2 - 3 = 3H_2,$$

hence the operator  $L$  in the Hermite polynomial basis is

$$A = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 3 \end{pmatrix}.$$