MATH 102: PROBLEM SET 4

DUE AT 16:00 ON FRIDAY, OCTOBER 27

(1) Find the line of best fit through the points $(2,3), (3,4), (4,5), (5,6)$.

(2) Let $V$ be the vector space of continuous functions $f: [0, 2\pi] \rightarrow \mathbb{R}$ equipped with the inner product

$$\langle f, g \rangle = \int_0^{2\pi} f(t)g(t)dt.$$  

Find the best approximation to $f(t) = e^t$ by a trigonometric polynomial of degree 2.

(3) Let $V$ be the vector space of trigonometric polynomials of degree 2 in a variable $t$, and let $D: V \rightarrow V$ be differentiation. Find the matrix of $D$ relative to the basis

$$e_1 = 1, \ e_2 = \cos(t), \ e_3 = \cos(2t), \ e_4 = \sin(t), \ e_5 = \sin(2t).$$