

## C20220 Quiz

Daniel Richardson, Norwood House 6.29, email masdr@bath.ac.uk

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**Problem 1** Give the axioms for a vector space  $V$  over  $\mathbf{R}$ .

**Problem 2** Let  $V$  be a vector space over  $\mathbf{R}$ . Give the axioms for an inner product  $\langle, \rangle$  on  $V$ .

**Problem 3** Let  $C[a, b]$  be the set of continuous function  $f : [a, b] \rightarrow \mathbf{R}$ . Define an inner product for  $C[a, b]$ .

**Problem 4** Let  $\langle, \rangle$  be an inner product on vector space  $V$ . For  $X, Y \in V$ , define  $X \perp Y$ .

**Problem 5** Suppose  $X, Y \in \mathbf{R}^D$ , neither are 0, and  $X \perp Y$ . Assume that  $c_1X + c_2Y = 0$ . Prove that  $c_1 = c_2 = 0$ .

**Problem 6** Find the best approximation to  $(2, 1, 3)$  in  $\text{SPAN}((1, 1, 2), (1, -1, 0))$ .

**Problem 7** Suppose we have found the order 10 Fourier approximation to  $f(t)$  on  $[-\pi, \pi]$ , and have found that  $a_4 = 32$ . Will this necessarily remain true in the order 20 Fourier approximation to  $f(t)$  on  $[-\pi, \pi]$ ?