MAU11S02 Group A2 Quiz 05 3pm 26/2/20

Rules and procedures.
1. Answers must be handed up at the end of the tutorial, no other time. **2.** Attempt 3 questions. Only *your first three answers* will be marked. **3.** Each question carries 20 marks, so the maximum quiz mark is 60. **4.** Marked quizzes will be returned, and answers published, the following week. **5.** If a particular method of solution is stipulated, you get no marks if you don't use it. **6.** The (9) quizzes will contribute 20% to your overall mark. **7.** You are allowed to collaborate and compare answers during the tutorial. **8.** ***Show all work.*** No marks will be given for answers which do not show the calculations.

Question 1. Let $P = (3, 2, 1)$ and $Q = (4, 2, 3)$. Compute a point N so that ON is normal to the plane OPQ. Let L be the line through O and N.

Calculate (i) the perpendicular projection Z of $(1, 1, 2)$ onto L, and (ii) the perpendicular reflection W of $(1, 1, 2)$ in L.

Question 2. With P and Q as above, calculate the perpendicular projection of $(1, 1, 2)$ onto the plane containing P and Q, and its perpendicular reflection in that plane.

Question 3. Calculate α, β such that $\alpha P + \beta Q$ is the point closest to $X = (4, 1, 4)$ in the plane OPQ, P, Q, as in Question 1, using the formula

$$(A^T A) \begin{bmatrix} \alpha \\ \beta \end{bmatrix} = A^T X.$$

Question 4. Calculate an orthonormal basis X_1, X_2, X_3 in $\mathbb{R}^3$, where X_3 is in the direction $(-1, -1, 1)$.

Question 5. Construct an orthonormal basis for $\mathbb{R}^3$ in which one vector is in the direction $(2, 3, 6)$.