Course MA2C02: Hilary Term 2012.

Assignment I.

To be handed in by Wednesday 11th April, 2012. Please include both name and student number on any work handed in. Assignments handed in after Wednesday 4th April 2012 should be returned to the School of Mathematics Office, 17/18 Westland Row.

- 1. Find the cosine of the angle between the vectors (1, 2, 4) and (2, 2, 6).
- 2. Find a non-zero vector that is orthogonal (i.e., perpendicular) to the vectors (1, 2, 6) and (2, 3, 9).
- 3. Find the equation of the plane that passes through the points (1, 1, 2), (2, 3, 5) and (4, -3, 7).
- 4. Calculate the quaternion products qr and rq where q = 2 + 3j + k and r = 3 + i + 4k.
- 5. Find an integer x which satisfies $x \equiv 7 \pmod{13}$, $x \equiv 3 \pmod{5}$ and $x \equiv 2 \pmod{3}$.
- 6. For each positive integer n, determine the value of the unique integer x_n satisfying $0 \le x_n < 29$ for which $384^n \equiv x_n \pmod{29}$.

(N.B., there will exist integers r and m such that $384^j \equiv 384^k \pmod{29}$ whenever $j \ge r$, $k \ge r$ and $j \equiv k \pmod{m}$. This fact should enable you to devise a specification that yields the value of $384^n \pmod{29}$ for all positive integers n, no matter how large.)