2BA1: Maths for Students in Computer Science
Tutorial work, April 4, 2008

1. For the 3-periodic sequence of complex numbers

$$a = \{\ldots, 3-2i, 1, 1, 3-2i, \ldots\}$$

(that is, $a_0 = 3-2i$, $a_1 = 1$ etc.), compute its discrete Fourier transform, its convolution with itself $a \star a$, and the discrete Fourier transform of $a \star a$.

2. Compute the product of quaternions $3-2i+j$ and $2+i-k$.

3. For vectors $\mathbf{u} = (5, 9, -2)$, $\mathbf{v} = (2, 3, 1)$, and $\mathbf{w} = (1, 0, 1)$, compute $(\mathbf{u}, \mathbf{v})$, $\mathbf{v} \times \mathbf{w}$, and $(\mathbf{w}, \mathbf{u} \times (\mathbf{v} \times \mathbf{w}))$.

4. Find the image of the point $(1, 1, 1)$ in 3-space under the rotation through $\frac{\pi}{3}$ about the line connecting the origin with $(4, 3, 12)$.