Course 2BA1: Michaelmas Term 2005.
Assignment II.

To be handed in by Friday 20th January, 2006.
Please include both name and student number on any work handed in.

1. Consider a graph with vertices a, b, c, d, e and f and edges $a\,b$, $b\,c$, $c\,d$, $d\,a$, $a\,e$, $b\,e$, $c\,f$, $d\,f$ and $e\,f$.

   (a) Draw a diagram showing the vertices and edges of this graph.

   (b) Is this graph regular?

   (c) Is this graph complete?

   (d) Is this graph regular?

   (e) Does this graph have an Eulerian circuit? If so, give an example.

   (f) Does this graph have a Hamiltonian circuit? If so, give an example.

   (g) Is this graph a tree?

   (h) Does this graph have a spanning tree? If so, give an example.

   [Briefly justify all your answers above.]

2. (a) What is the angle between the vectors $(1, 1, 0)$ and $(0, 1, 1)$? [Hint: consider the scalar product.]

   (b) Find a non-zero vector that is perpendicular to the vectors $(1, 1, 2)$ and $(1, 2, 3)$.

   (c) What is the area of the parallelogram with vertices at the points $(0, 0, 0)$, $(1, 1, 2)$, $(2, 3, 5)$ and $(1, 2, 3)$? [Hint: the area of a parallelogram $OACB$ in space with vertices at the points O, A, C and B, where the side OA is parallel to the side BC, is equal to the length of the side OA, multiplied by the length of the side OB, multiplied by the sine of the angle between these two sides.]

   (d) What is the distance from the point $(1, 1, 1)$ to the plane $\{(x, y, z) \in \mathbb{R}^3 : 3x + 4y + 12z = 188\}$? And which point on that plane is closest to the point $(1, 1, 1)$?