

**M3H PROBLEMS 7. 22.2.2016**

Q1 (*Euler characteristic; Euler's polyhedron formula, 1752*).

Show that the numbers  $F$  of faces,  $E$  of edges and  $V$  of vertices of a polyhedron are linked by

$$\chi := V - E + F = 2.$$

Q2 (*Duality*).

Apply the duality of Projective Geometry to Euler's polyhedron formula, and illustrate this for the Platonic solids.

Q3 (*Archimedean (truncated Platonic) solids*).

Show what happens to the  $F, V, E, \chi$  when a polyhedron is truncated, and illustrate this for the Archimedean (truncated Platonic) solids.

Q4 (*Stirlings's formula: James Stirling (1692-1730) in 1730*).

Show that

$$n! \sim \sqrt{2\pi} e^{-n} n^{n+\frac{1}{2}} \quad (n \rightarrow \infty).$$

NHB