Answer all the questions.

1. Let $G$ be a simple graph with at least 3 nodes such that for all nonadjacent nodes $u$ and $v$,
   \[ \text{deg} u + \text{deg} v \geq p(G) \]
Prove that $G$ is Hamiltonian.

2. Sketch the drawings that demonstrate that if
   \[ \text{perimeter}(P) = \ldots c \ldots c \ldots \]
then $P$ can be modified so that its perimeter contains $\ldots d \ldots$ (Cross-cap normalization).

3. Identify the surfaces of the following polygonal presentations:
   (a) $abcd, bdef, cf^{-1}ae$  (b) $abcd, bdef, cf^{-1}ae^{-1}$

4. For which values of $n$ is the graph $K_{3n-10, 2n+8}$
   a) Eulerian  b) Hamiltonian  c) Planar?

5. Identify the bordered surface in Figure 1.

Figure 1: