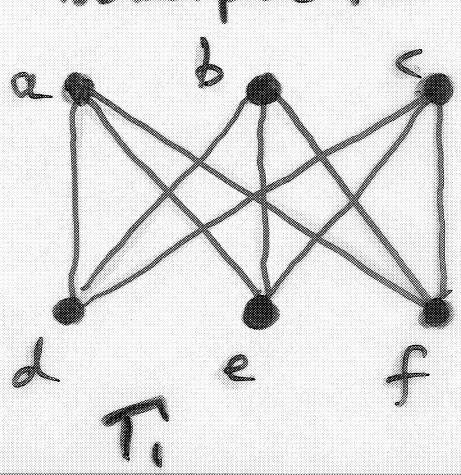
More on Graphs

We return now to look again at graphs, and will start by only considering *undirected* graphs. To clarify our notation; a (v, ε)-graph is one having a total of v nodes and ε edges, nodes joined by an edge are *neighbours*, the *degree* of a node $deg(v)$ is the number of edges joining it, and the *degree sequence* of a graph Γ is a list of the degrees of the nodes from the largest, $\Delta(\Gamma)$, to the smallest, $\delta(\Gamma)$. There are a couple of quick observations due to Euler ...

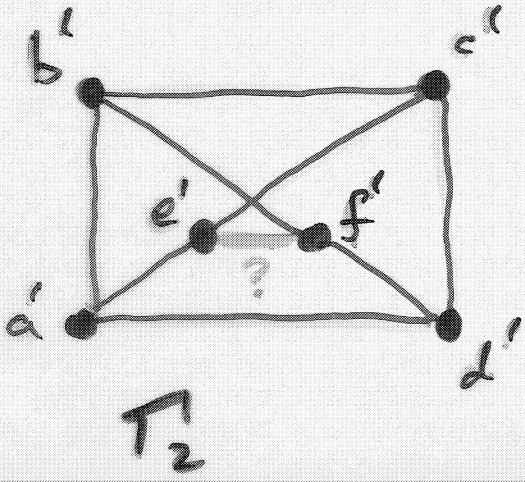
Fact: $\sum_{i=1}^{v} deg(v_i) = 2\varepsilon$ for Γ a (v, ε)-graph.

This follows easily since each edge has to meet two nodes. As a consequence, of course, the number of odd degree nodes in Γ must be even. We note that if every node of Γ has the same degree d, then we say that Γ is *d-regular* and that $deg(\Gamma) = d$.

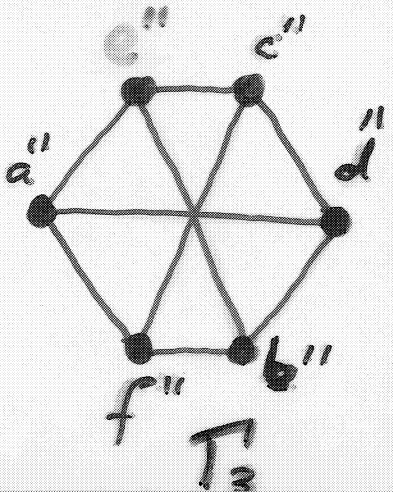
Two graphs $\Gamma_1 \simeq \Gamma_2$ are *isomorphic* if $\exists$ one to one correspondence between their sets of nodes which preserves adjacency. For example, which of the following are isomorphic?



Γ_1



Γ_2



Γ_3