Proof Portfolio

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Theorem 1. *A graph G is regular if and only if $\overline{G}$ is regular.*

Proof. Asumme a graph G is r-regular with n vertices. This means that every vertex $v \in V(\overline{G})$ is adjacent to $(n-1)-r$ vertices. As such, $\overline{G}$ is a $[(n-1)-r]$-regular graph. Thus, if G is regular then $\overline{G}$ is also regular.

Assume a graph $\overline{G}$ is r-regular. We know that the complement of $\overline{G}$ is also regular due to the previous reasoning. By definition, the complement of a complement is the original object so G is also regular. Thus, we can conclude a graph G is regular if and only if $\overline{G}$ is regular. ■