

Section 1.1.3

- 1 We have an edge for every distinct pairs of vertices, so $\binom{n}{2} = \frac{n(n-1)}{2}$.
- 2 We prove the contrapositive. Suppose $r_1 \neq r_2$, $|X| = r_1$ and $|Y| = r_2$. Then for $x \in X$, $\deg(x) = r_2$ and for $y \in Y$ $\deg(y) = r_1$, but $r_2 \neq r_1$, so K_{r_1, r_2} is not regular.
- 3 No, no matter which 4 vertices you choose, 2 of them will be in the same subset, and would have no edges between them.
- 4 No. Having all 4 vertices in the same set will induce a disconnected graph, 3 in X and 1 in Y would result in a edges between the single vertex in a partition set to the other three, and 2 in X and 2 in Y induces a graph with a cycle.
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- 7 For part c), we have $order = m$, $size = \sum_{i=1}^n \frac{(r_i-1)r_i}{2}$.
- 8 Suppose G and H are isomorphic. There exists a bijection f from $V(G)$ to $V(H)$ such that $xy \in E(G) \Leftrightarrow f(x)f(y) \in E(H)$.

$$xy \in E(\overline{G}) \Leftrightarrow xy \notin E(G) \Leftrightarrow f(x)f(y) \notin E(H) \Leftrightarrow f(x)f(y) \in E(\overline{H})$$

. Thus the complements are isomorphic.