$\mathcal{R}$-colorings

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For any graph G, a collection $\mathcal{R} = \{R_1, R_2, \ldots, R_t\}$ of subsets of the vertex set $V(G)$ can be selected. Common choice for $\mathcal{R}$ are $\mathcal{R}^{(1)} = E(G)$, the collection of edges, $\mathcal{R}^{(2)} = \{N[v_1], N[v_2], \ldots, N[v_n]\}$, the collection of closed neighborhoods, and $\mathcal{R}^{(3)} = \{N(v_1), N(v_2), \ldots, N(v_n)\}$, the collection of open neighborhoods. Recognizing that the chromatic number is defined relative to the edge set $\mathcal{R}^{(1)} = E(G)$, I consider how other chromatic numbers arise by considering other $\mathcal{R}$-collections.

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