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Cohen-Macaulayness of Monomial Ideals

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This lecture presents a combinatorial criterion for the Cohen-Macaulayness of a monomial ideal. This results cover all previous results in this topic. In particular, we can describe all square-free monomial ideals whose ordinary or symbolic powers are Cohen-Macaulay. It turns out that if I is the Stanley-Reisner ideal of a simplicial complex, then I^n or $I^{(n)}$ is Cohen-Macaulay for a fixed $n > 2$ iff the simplicial complex is a complete intersection or a matroid, respectively.