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Maximal Knotless Graphs

A graph G is maximal knotless if it is edge maximal for the property of having a knotless embedding. That is, there exists an embedding of G into S^3 such that every cycle in G is the unknot, but for any edge e, any embedding of $G' = G + e$ has a cycle that is embedded as a non-trivial knot.

We show that any maximal knotless graph must have at least $|E| \geq \frac{7}{4}|V|$ edges, and we construct an infinite family of maximal knotless graphs with $|E| < \frac{5}{2}|V|$. For any $|E| \geq 20$ (with the exception of $|E| = 22$) we construct a maximal knotless graph with $|E|$ edges. We also construct an infinite family of maximal knotless graphs that are not clique sums.

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