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Roots of low-dimensional objects

We develop a new version of the famous Diamond Lemma [1] and describe several results on prime decompositions of different geometric objects. All results are obtained by using that version and the standard technics for removing intersections of surfaces.

- The Kneser-Milnor prime decomposition theorem of 3-manifolds into connected sums of prime factors (new proof).
- The similar theorem of Swarup for decompositions into boundary connected sums (new proof).
- 3. A prime decomposition theorem for knotted graphs in 3-manifolds containing no nonseparating 2-spheres.
- 4. Counterexamples to prime decomposition theorems for knots in 3-manifolds and for 3orbifolds.
- 5. A new theorem on annular splittings of 3-manifolds, which is independent of the JSJ-splitting theorem.
- 6. An existence and uniqueness theorem for prime decompositions of homologically trivial knots in thick surfaces.
- 7. Prime decomposition theorem for virtual knots.

Reference:

[1] M. H. A. Newman, On theories with a combinatorial definition of "equivalence", Ann. Math. 43 (1942), 223-243.