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5. Differential Geometry and Global Analysis

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Embedding and knotting of flat surfaces in 3-space

In 3-space, any compact surface with nonempty boundary is isotopic to a flat (zero Gaussian curvature) surface and two such flat surfaces are isotopic if and only if they are isotopic through flat surfaces. An akin to Seifert surfaces is though: Any simple closed space curve can be deformed to bound a flat surface. A necessary condition for a link to bound a flat surface with Euler characteristic χ is to have at least $2|\chi|$ 3-singular points, i. e. points with either zero curvature or zero torsion. This is a generalized vertex theorem for closed space curves. A necessary and sufficient condition for a knot to bound an orientable flat surface of a nice, but generic, type will be presented.