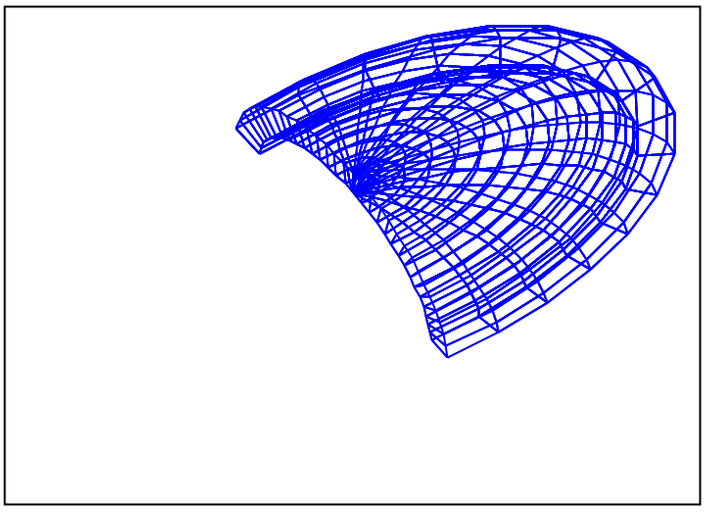
Converting Surfaces to Solids

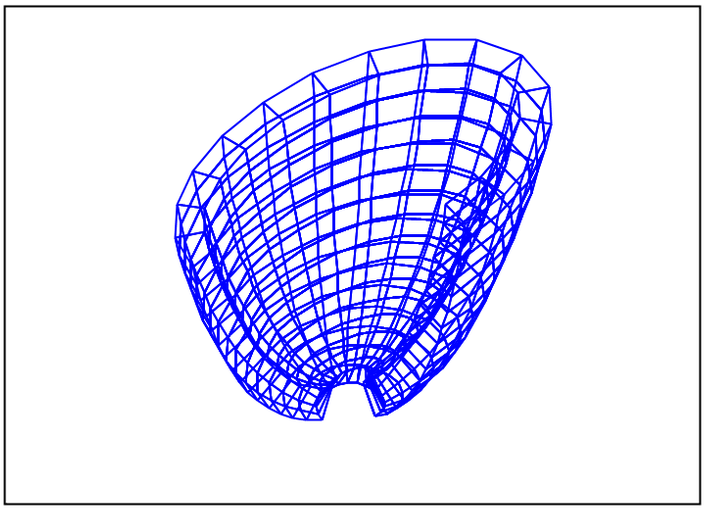
The solid is formed from the initial surface, the offset surface, and the lateral surface that connects them. The lateral surface is formed by normals reconstructed from the boundary nodal points of the initial surface.

$$Solid(x, h) := \left| \begin{array}{l} \left[c := [1..3] \quad g_c := \frac{d}{dx_c} f(x) \quad G(x) := g \quad u(a) := \frac{G(a)^T}{norme(G(a))} \right] \\ \text{for } k \in [1..rows(initSur)] \\ \quad \left| \begin{array}{l} \left[nodeInit_k := eval(row(initSur, k)) \quad unitNorm_k := u(nodeInit_k) \right] \\ nodeOffset_k := eval(nodeInit_k + h \cdot unitNorm_k) \\ \text{if } k = 1 \\ \quad meshOffset := nodeOffset_k \\ \text{else} \\ \quad meshOffset := stack(meshOffset, nodeOffset_k) \end{array} \right. \\ \left[k := [1..rows(border)] \quad nodeB_k := eval(row(border, k)) \quad unitNormB_k := u(nodeB_k) \right] \\ normalB_k := eval(stack(nodeB_k, nodeB_k + h \cdot unitNormB_k) \cdot \gamma \cdot zum) \\ solid := eval(stack([initSur \cdot \gamma \cdot zum], normalB, [meshOffset \cdot \gamma \cdot zum])) \\ pCycleC(solid) \end{array} \right.$$

$$f(x) := \frac{(x_1)^2}{9^2} + \frac{(x_2)^2}{4.5^2} + \frac{(x_3)^2}{3^2} - 1 \qquad initSur := s3 \qquad h := 1 \qquad border := b3$$

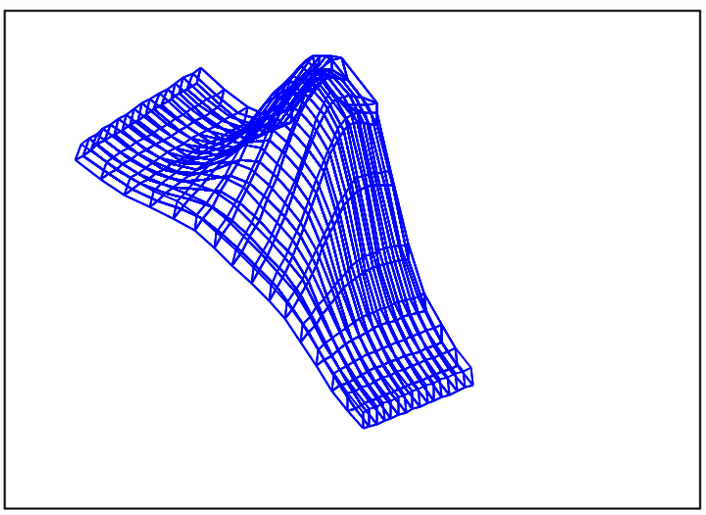


$$f(x) := \frac{x_1^2}{2^2} + \frac{(x_2)^2}{1^2} - x_3 + 5 \qquad initSur := s6 \qquad h := 1 \qquad border := b6$$



$initSur := s9 \qquad h := -0.8 \qquad border := b9$

$$f(x) := 9 \cdot \frac{0.01 \cdot \mathbf{e}^{x_1}}{0.094 + (x_1)^4 + (x_2)^4} - x_3$$



$$f(x) := \sin(0.5 \cdot x_1 + 0.5 \cdot x_2) - x_3 \qquad initSur := s4 \quad h := -1 \qquad border := b4$$