

Tutorial Week 4

MATH3968: Differential Geometry

Semester 2, 2009

Lecturer: Emma Carberry

Required Problems

1. Lecture Notes, Exercise Set 3, Question 2abd. Interpret the question as asking whether the map describes a regular parametrised surface, not a regular surface.
2. do Carmo, §2.2 p65, Q18.
3. do Carmo, §2.4 p88, Q4.
4. Let $\alpha : I \rightarrow \mathbb{R}^3$ be a regular curve, parametrised by arc-length, and such that $k(s) \neq 0$. Let $n(s)$ and $b(s)$ be the unit normal and binormal vectors along the curve. Let $r > 0$ be fixed and define a parametrised surface by $F(s, v) = \alpha(s) + r(n(s) \cos(v) + b(s) \sin(v))$, for $s \in I$ and $0 < v < 2\pi$.

Show that $n(s, v) = -(n(s) \cos(v) + b(s) \sin(v))$.

Are such surfaces always regular?

(c.f. do Carmo §2.4, p88, Q11).

Recommended Problems

5. Compute the normal vector field $n(u, v)$ for the helicoid parametrized by $F(u, v) = (v \cos(u), v \sin(u), au)$, where $0 < u < 2\pi$ and $v \in \mathbb{R}$.
(c.f. do Carmo §2.4, p88, 9).