

MATH 436
HOMEWORK 1
DUE SEPTEMBER 11, 2007

- (1) Find a parametrized curve $\alpha: \mathbb{R} \rightarrow \mathbb{R}^2$ whose image is the circle

$$\{(x, y) \in \mathbb{R}^2 \mid x^2 + y^2 = 1\},$$

with $\alpha(t)$ running clockwise around the circle, and $\alpha(0) = (0, 1)$.

- (2) Let $\beta: \mathbb{R} \rightarrow \mathbb{R}^3$ be defined by

$$\beta(t) = (3 \cos(t), 3 \sin(t), 4t).$$

Compute the arc-length of β between 0 and t for any t .

- (3) Let $\gamma: \mathbb{R} \rightarrow \mathbb{R}^3$ be defined by

$$\gamma(t) = (\cosh(t), \sin(t), \cos(t)).$$

Find a unit-speed reparametrization of γ .

- (4) Let $\delta: (a, b) \rightarrow \mathbb{R}^3$ be a curve, and $v \in \mathbb{R}^3$ a fixed vector. Suppose that $\delta(t_0)$ is perpendicular to v for some $t_0 \in (a, b)$, and that for all $t \in (a, b)$, $\dot{\delta}(t)$ is perpendicular to v . Show that $\delta(t)$ is perpendicular to v for all $t \in (a, b)$.