

Vector Analysis

Spring 2014

Ex Tempore 3

Wed 12.3.

1. Give the tangent vectors $\hat{T}(t)$ normal vectors $\hat{N}(t)$ of the following curves:

a. $\vec{r}(t) = t\hat{i} - 2t^2\hat{j} + 3t^3\hat{k}$

b. $\vec{r}(t) = a \sin(\omega t)\hat{i} + a \cos(\omega t)\hat{j}$

c. $\vec{r}(t) = a \cos t\hat{i} + b \sin t\hat{j} + t\hat{k}$

2. Determine the curvature of the circular helix

$$\vec{r}(t) = a \cos t\hat{i} + a \sin t\hat{j} + bt\hat{k} .$$

3. At which point the curvature of the curve $y = \ln x$ is the largest and what is its value there. Hint: Use the coordinate x as the curve parameter.