



Curves and Surfaces (MTH201)
Academic Session 2012-13

Tutorial Sheet 6

October 3 2012

Instructions: Write main ideas / hints for solving questions in your tutorial noteook. There is no need to write full and formal solution during the tutorial session. However during off class hours you should practice writing these solutions in a formal manner. **Get the signature of your tutor after each session.**

1. For what functions f the curve $\gamma(t) = (\cos t, \sin t, f(t))$ is planar?
2. A curve is given in the polar form $\gamma(\theta) = (r(\theta) \cos \theta, r(\theta) \sin \theta)$. Show that its curvature is given by

$$\kappa(\theta) = \frac{2r'(\theta)^2 - r(\theta)r''(\theta) + r(\theta)^2}{(r(\theta)^2 + r'(\theta)^2)^{3/2}}.$$

3. Find all curves for which $\kappa = 1 = \tau$.
 4. Calculate curvature and torsion for the curve $\gamma(t) = \left(t, \frac{1+t}{t}, \frac{1-t^2}{t}\right)$.
 5. Calculate the curvature, torsion and Frenet frame for the curve $\gamma(t) = (\cos 2t, \sin 2t, 2 \sin t)$.
 6. Compute the Frenet frame for the curve $\gamma(t) = \left(t, \frac{t^2}{2}, \frac{t^3}{6}\right)$. Show that as t approaches ∞ the curve γ becomes a straight line, and the Frenet frame becomes: $\mathbb{T} = (0, 0, 1)$, $\mathbb{N} = (0, -1, 0)$, $\mathbb{B} = (1, 0, 0)$.
-