Sheet 8 – Cüneyt Erem, Sheikh Mashura Farzana, Md Emtazul Haque

Theory

As-2 3/4

Write more clearly or you will lose points!

a) $p(t): \mathbb{R} \to \mathbb{R}^2$ of circle, R, t ?

$p(t) = \begin{pmatrix} r\cdot\cos t \\ r\cdot\sin t \end{pmatrix}$ where $t \in [0, 2\pi]$. ✓

b) tangent vector $T(t)$ at $t = \pi/4$ and $R = 2$?

$T(t) = \frac{dp(t)}{dt} = \begin{pmatrix} -r\cdot\sin t \\ r\cdot\cos t \end{pmatrix} = \begin{pmatrix} -2\cdot\sin \pi/4 \\ 2\cdot\cos \pi/4 \end{pmatrix} = \begin{pmatrix} -\sqrt{2} \\ \sqrt{2} \end{pmatrix}$ ✓

c) prove curve is regular, with r and t ?

if the curve is continuously differentiable and derivative is not equal to zero, then it is called regular,

we know that $\frac{dp(t)}{dt} = \begin{pmatrix} -r\sin t \\ r\cos t \end{pmatrix}$ so it is differentiable, also continuously because -sin, cos are continuous...

for $p'(t) \neq 0$, $\begin{pmatrix} -r\sin t \\ \cos t \end{pmatrix} \neq 0$ if $r > 0$

so it is regular (✓) ← short explanation

d) length parametered ?

curve is length parametered iff $\|p'(t)\| = 1$, $t \in \mathbb{R}$

then $p(t) = \begin{pmatrix} 2\cos t \\ 2\sin t \end{pmatrix}$

$\|p'(t)\| = \sqrt{(-2\sin t)^2 + (2\cos t)^2}$

$= \sqrt{4(\underbrace{\sin^2 t + \cos^2 t}_{1})}$

$= 2$

so it is not arc length parameterized. for $R = 2$.

Practical Points: 0/6 (no hand in)

consider what happens for different P...