BIRZEIT UNIVERSITY
MATHEMATICS DEPARTMENT

Quiz 3 Math2311 Fall 2018/2019

Name.....**BZU#**.....**Section#**.....

Consider the position vector function $r(t) = (\cos t)i + (\sin t)j - k$

1. Find the curvature at $t = \frac{\pi}{2}$

The curve is a circle of radius 1 $\therefore K = \frac{1}{1} = 1$

or $K = \frac{1}{|v|}\left|\frac{dT}{dt}\right|$

$v = \langle -\sin t, \cos t, 0\rangle \Rightarrow |v| = 1 \Rightarrow T = \langle -\sin t, \cos t, 0\rangle$

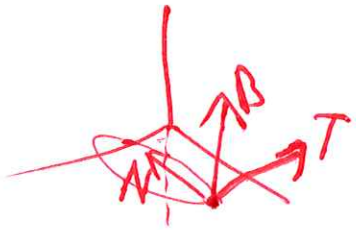
$\Rightarrow \frac{dT}{dt} = \langle -\cos t, -\sin t, 0\rangle \Rightarrow \left|\frac{dT}{dt}\right| = 1$

$\Rightarrow K = \frac{1}{1} = 1$

2. Show that the Osculating plane at $t = \frac{\pi}{2}$ is $z = -1$

$r(\frac{\pi}{2}) = \langle 0, 1, -1\rangle \Rightarrow$ Point on plane is $(0, 1, -1)$

$T(\frac{\pi}{2}) = \langle -1, 0, 0\rangle$



$\Rightarrow N(\frac{\pi}{2}) = \langle 0, -1, 0\rangle$

$\Rightarrow B = \begin{vmatrix} i & j & k \\ -1 & 0 & 0 \\ 0 & -1 & 0 \end{vmatrix} = \langle 0, 0, 1\rangle$ Normal to osculating plane

$\therefore$ eqn of plane is $0(x-0) + 0(y-1) + 1(z-(-1)) = 0$

$\Rightarrow z = -1$