Quiz 1

MATH 32A-3, CALCULUS OF SEVERAL VARIABLES, FALL 2016

SECTION: 3A 3B (3C) 3D 3E 3F (CIRCLE ONE)

9

NAME: HE KAI LIM

You have 15 minutes to solve the following two problems. Show all of your work. To receive full credit, your answers must be neatly written and logically organized.

Problem 1.(5 points.) Find an equation of the plane passing through the points $P = (1, 0, 0)$, $Q = (0, 1, 1)$ and $R = (2, 0, 1)$.

$\vec{PQ} = \langle 0-1, 1-0, 1-0 \rangle$

$= \langle -1, 1, 1 \rangle$

$\vec{PR} = \langle 2-1, 0-0, 1-0 \rangle$

$= \langle 1, 0, 1 \rangle$

Plane passing through both lines has normal $\perp$ to both

$\therefore$ Normal: $\vec{PQ} \times \vec{PR} = \langle -1, 1, 1 \rangle \times \langle 2, 0, 1 \rangle$

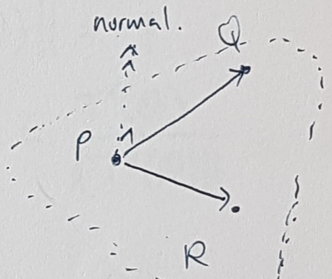
$= \begin{vmatrix} 1 & 1 \\ 0 & 1 \end{vmatrix} \hat{i} - \begin{vmatrix} -1 & 1 \\ 2 & 1 \end{vmatrix} \hat{j} + \begin{vmatrix} -1 & 1 \\ 2 & 0 \end{vmatrix} \hat{k}$

$= \langle 1, 3, -2 \rangle$

sub point P: $\langle 1, 3, -2 \rangle \cdot \langle 1, 0, 0 \rangle$

$= 1$

$\therefore$ equation of plane: $x + 3y - 2z = 1$ //.



Problem 2.(5 points.) Let C be the curve given by $\mathbf{r}(t) = \langle t\cos t, t\sin t, t \rangle$ for $-\infty < t < \infty$. Show that C lies on the cone $x^2 + y^2 = z^2$.

C: $x = t\cos t$, $y = t\sin t$, $z = t$ | $-\infty < t < \infty$

Cone: $x^2 + y^2 = z^2$

Sub C into x^2+y^2 (left-hand side of cone equation)

Left hand side: $x^2 + y^2 = (t\cos t)^2 + (t\sin t)^2$

$= t^2\cos^2 t + t^2\sin^2 t$

$= t^2(\cos^2 t + \sin^2 t)$

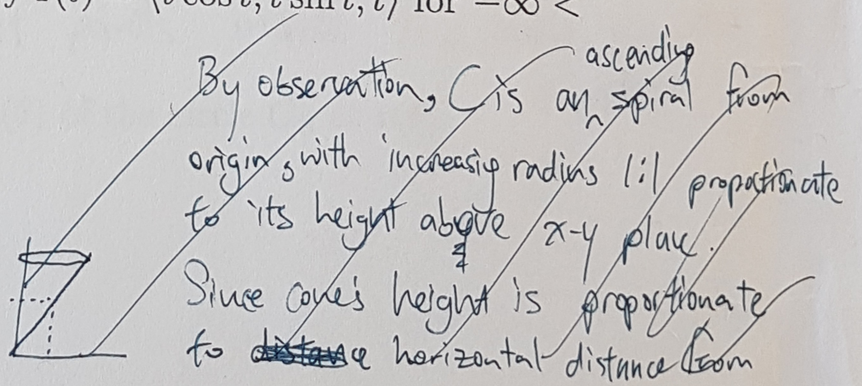
$= t^2(1)$

$= t^2$

$= z^2$

i.e. Right-hand side of cone $x^2+y^2=z^2$ equation.

QED //.



By observation, C is an ascending spiral from origin, with increasing radius $\parallel$ proportionate to its height above x-y plane.

Since cone's height is proportionate to ~~distance~~ horizontal distance from