MATH 201.2 (091)

Quiz 3 (Chap. 12.5-7) Duration: 15mn

Name: **ID number:**

1.)(5pts) Find an equation of the plane through the points $P_1(-2,1,4)$ and $P_2(1,0,3)$ that is perpendicular to the plane $4x-y+3z=2$.

2.)(5pts) Convert the equation $\phi=\frac{\pi}{4}$ into rectangular coordinates and sketch its graph.

1) let $\vec{n}$ a normal vector to the plane $4x-y+3z=2$.

For any point M in the plane that contains P_1 and P_2 and that is perpendicular to $4x-y+3z=2$, we have

$$(\overrightarrow{P_1M}\times\overrightarrow{P_1P_2})\cdot\vec{n}=0$$

$$\overrightarrow{P_1M}\times\overrightarrow{P_1P_2}=\begin{vmatrix}\vec{i} & \vec{j} & \vec{k}\\ x+2 & y-1 & z-4\\ 3 & -1 & -1\end{vmatrix}$$

$$=\langle -y+z-3,\ x+3z-10,\ -x-3y+1\rangle$$

$$\vec{n}=\langle 4,-1,3\rangle.$$

So, $4(-y+z-3)-(x+3z-10)+3(-x-3y+1)=0$

$$\boxed{-4x-13y+z+1=0}$$

2) $x^2+y^2+z^2=\rho^2$

$z=\rho\cos\phi=\rho\frac{\sqrt{2}}{2}$

Thus, we have

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

$$\boxed{x^2+y^2-z^2=0,\quad z>0}$$

This is a cone