MATH 205 ANALYTIC GEOMETRY **Quiz 9** 23.01.2006

Name **Student No.** **Sign**

You will not get any points if your answer is wrong, that is no points to your explanations if your answer is wrong. And of course no points to a correct answer if your explanation or proof is not correct or clear.

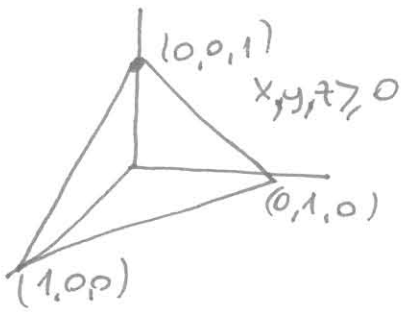
YOU must write GOOD Mathematics

1. Find the equation of the plane through the points $(1,0,0), (0,1,0), (0,0,1)$.
SOLUTION:

Let A, B, C be the respective points. Then

$\vec{AB} = (0-1)\underline{i} + (1-0)\underline{j} + (0-0)\underline{k}$ and

$\vec{AC} = (0-1)\underline{i} + (0-0)\underline{j} + (1-0)\underline{k}$.



The normal vector for the plane is

$$\vec{n} = \begin{vmatrix} i & j & k \\ -1 & 1 & 0 \\ -1 & 0 & 1 \end{vmatrix} = \underline{i} - (-1)\underline{j} + \underline{k} = \underline{i} + \underline{j} + \underline{k}$$

Let $P(x,y,z)$ be an arbitrary point on the plane. Then we have $\vec{PA} \cdot \vec{n} = 0$, i.e. $(x-1).1 + (y).1 + z.1 = 0$

$$\boxed{x+y+z=1}$$

2. Find the distance between the plane above and the point $(2,2,4)$.
SOLUTION:

Let S be the point $(2,2,4)$ and consider the vector

$\vec{AS} = (2-1)\underline{i} + (2-0)\underline{j} + (4-0)\underline{k} = i + 2j + 4k$

project this vector on $\vec{n}$ and then find its length.

$$d = \frac{|\vec{AS} \cdot \vec{n}|}{|\vec{n}|} = \frac{|1.1 + 2.1 + 4.1|}{\sqrt{1^2+1^2+1^2}}$$

$$= \frac{7}{\sqrt{3}}$$