Group Quiz 2
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Math 153 – Spring 2012

Name: KEY

No work = no credit

1.) Show that the line given by $\vec{r}(t) = \langle t, 3t-2, -t \rangle$ intersects the plane $x + y + z = 1$. Find the point of intersection. Find the angle between.

$t + (3t - 2) - \cancel{t} = 1$

$\Rightarrow \quad 3t - 2 = 1$

$\Rightarrow \quad t = 1$

point: $(1, 1, -1)$.

$\vec{N} = \langle 1, 1, 1 \rangle$

$\vec{D} = \langle 1, 3, -1 \rangle$

$\vec{N} \cdot \vec{D} = 3$

$\Rightarrow 3 = \sqrt{3} \cdot \sqrt{11} \cos\theta$

$\Rightarrow \theta = \arccos\left(\frac{3}{\sqrt{33}}\right)$

2.) Consider the plane $x + y + z = 0$. Give three distinct points with integer coordinates that lie on this plane and are not co-linear. Then find the area of the triangle formed by those three points.

Answers will vary

$A(1, 1, -2)$

$B(0, 1, -1)$

$C(1, 0, -1)$

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

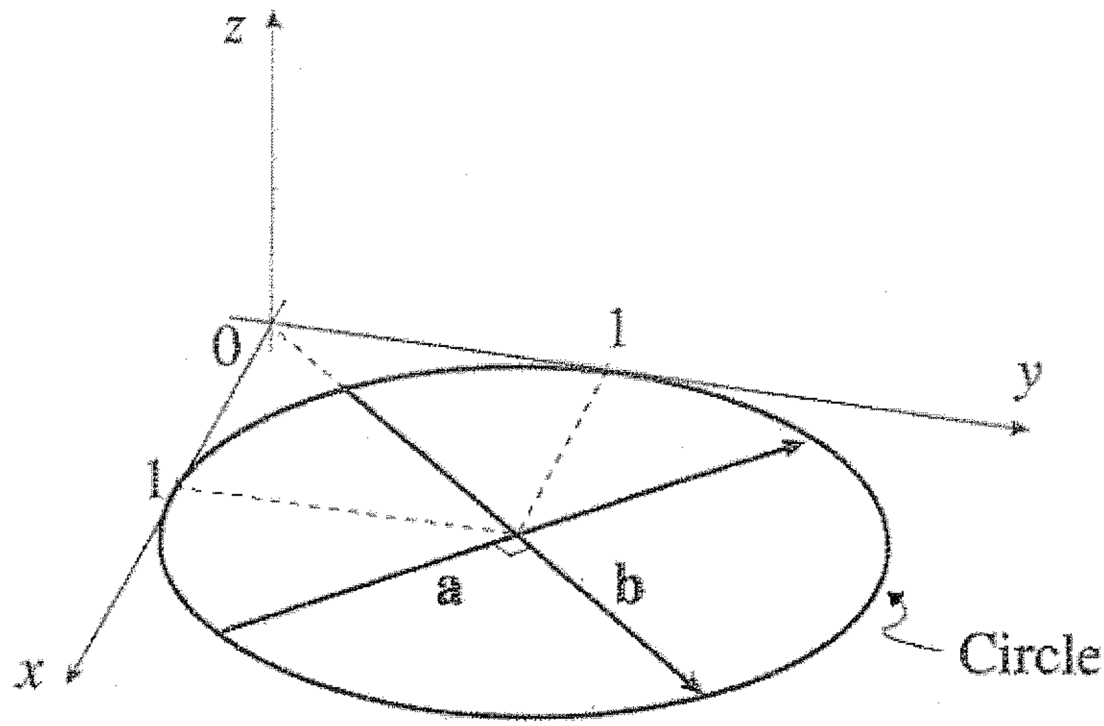
$\vec{v} = \langle 1, -1, 0 \rangle$

$\vec{u} \times \vec{v} = \langle -1, -1, -1 \rangle$

$|\vec{u} \times \vec{v}| = \sqrt{3}$ (area of a parallelogram)

triangle area $\frac{\sqrt{3}}{2}$

3.) Consider the diagram below and use it to give component representations of each vector.



a.) $\vec{a}$ $= \langle -\sqrt{2}, \sqrt{2}, 0 \rangle$

b.) $\vec{b}$ $= \langle \sqrt{2}, \sqrt{2}, 0 \rangle$

c.) $\vec{a} \times \vec{b}$ $= \langle 0, 0, -4 \rangle$

d.) $\vec{a} + \vec{b}$ $= \langle 0, 2\sqrt{2}, 0 \rangle$

$$\begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 0 & 2\sqrt{2} & 0 \\ 0 & 0 & -4 \end{vmatrix}$$

e.) $(\vec{a} + \vec{b}) \bullet (\vec{a} \times \vec{b})$ $= 0$

f.) $(\vec{a} + \vec{b}) \times (\vec{a} \times \vec{b})$ $= \langle -8\sqrt{2}, 0, 0 \rangle$