"QUIZ" for Lecture 3

E-MAILSCANNED .pdf OF COMPLETED QUIZ to DrZcalc3@gmail.com (Attachment: q3FirstLast.pdf) ASAP BUT NO LATER THAN Sept. 15, 8:00pm

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1. Find an equation of the plane that passes through the points $(0,1,1)$, $(1,0,1)$, $(1,1,0)$.

$A = (0,1,1)$, $B = (1,0,1)$, $C = (1,1,0)$

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

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

Take cross product to get ⊥ vector:

$$\vec{AB} \times \vec{BC} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & -1 & 0 \\ 0 & 1 & -1 \end{vmatrix} = \hat{i} - (-1)\hat{j} + (1)\hat{k} = \langle 1,1,1 \rangle$$

Equation of 3D Plane:

$a(x-x_0) + b(y-y_0) + c(z-z_0) = 0$ where $\langle a,b,c \rangle = \langle 1,1,1 \rangle$ (⊥ vector)

$\langle x_0, y_0, z_0 \rangle = (0,1,1)$

$1(x-0) + 1(y-1) + 1(z-1) = 0 \Rightarrow x + y - 1 + z - 1 = 0 \Rightarrow \boxed{x+y+z = 2}$

2. Find the intersection of the line

$$\mathbf{r}(t) = \langle 1,1,0 \rangle + t\langle 0,2,4 \rangle$$

and the plane

$$x + y + z = 14 \quad .$$

$r(t) = \langle 1,1,0 \rangle + \langle 0, 2t, 4t \rangle$

$r(t) = \langle 1, 1+2t, 4t \rangle$

$x = 1$

$y = 1+2t$

$z = 4t$

→ plug into $x+y+z = 14$

$(1) + (1+2t) + (4t) = 14$

$6t = 12$

$t = 2$

→ plug 2 into parametric equations:

$x(2) = 1$

$y(2) = 1 + (2)(2) = 5$

$z(2) = 4(2) = 8$

intersection: $(1,5,8)$