Quiz 1

MATH 261, CALCULUS III, SPRING 2018

SECTION:

NAME: key

Instructions: Solve as many of these problems as you can. Circle the correct answer, and show your work!

Problem 1. Find the angle between the planes given by the equations

$$x+y=2 \text{ and } x+y+\sqrt{2}z=\sqrt{6}$$

(a) $\pi/2$

(b) $\pi/4$

(c) $\pi/6$

(d) π

(e) $\pi/3$

Angle between planes = Angle between normal vecs.

$\langle 1,1,0\rangle \cdot \langle 1,1,\sqrt{2}\rangle = |\langle 1,1,0\rangle||\langle 1,1,\sqrt{2}\rangle|\cos\theta$

$1+1 = 2 = \sqrt{2}\cdot\sqrt{4}\cos\theta$

$\Rightarrow \theta = \pi/4$

Problem 2. Let $\vec{a}=(1,-1,2)$ and $\vec{b}=(2,1,0)$. Find t such that the vector $\vec{c}=(5,t-1,2)$ is perpendicular to $\vec{a}\times\vec{b}$.

(a) $t=1$

(b) $t=2$

(c) $t=-1$

(d) $t=-2$

(e) $t=0$.

$\vec{a}\times\vec{b} = \begin{vmatrix} i & j & k \\ 1 & -1 & 2 \\ 2 & 1 & 0 \end{vmatrix} = (-2,4,3)$.

$\vec{c}$ is perp to $\vec{a}\times\vec{b} \Leftrightarrow \vec{c}\cdot(\vec{a}\times\vec{b}) = 0$

$(5,t-1,2)\cdot(-2,4,3)$

$-10+4t-4+6 = 4t-8$

So $4t=-8$, $t=-2$.

Problem 3 The plane passing through $(0,1,0)$ and parallel to the plane $x+y-2z=3$ intersects the x axis at the point:

(a) $(-1,0,0)$

(b) $(1,0,0)$

(c) $(-2,0,0)$

(d) $(2,0,0)$

(e) $(-3,0,0)$

Parallel to $x+y-2z=3 \Leftrightarrow$ of form $x+y-2z=C$

Passing thru $(0,1,0) \Leftrightarrow 0+1+-2\cdot 0 = C$

$\Leftrightarrow C=1$

so plane is $x+y-2z=1$.

Intersects x axis when $y=z=0$, so $x+0-2\cdot 0=1$

$\Rightarrow x=1$

Problem 4 Let L be the line parallel to the planes $x-y+z=1$ and $2x+y+z=4$ and that passes through $(1,3,-3)$. At what point does L intersect the plane $z=0$?

(a) (1,-2,0)

(b) (2,1,0)

(c) (1,3,0)

(d) (-2,2,0)

(e) (-1,4,0)

L has direction vector $(1,-1,1)\times(2,1,1)$

$=(-2,1,3)$

Passes thru $(1,3,-3)$

so Parm. eq. is $\vec{r}(t) = (1-2t, 3+t, -3+3t)$

which hits $z=0$ when $t=1$ $\Rightarrow$

$\vec{r}(1) = (1-2, 3+1, 0) = (-1,4,0)$