HW p517 11,12

Day ① HW: p.553 #8,9,10
Day ② HW: p. 517 #6-12

12. Determine the Cartesian equation of the plane that is parallel to the line with equation $x = -2y = 3z$ and that contains the line of intersection of the planes with equations $x - y + z = 1$ and $2y - z = 0$.

① $x-y+z=1$
② $2y-z=0$ add

$x+y=1$

let $x=t$
then $y=1-t$
and $z=2-2t$

∴ line of intersection is
$\vec{r}=(0,1,2)+t(1,-1,-2)$

parallel to $x=-2y=3z$

$\frac{x-1}{1}=\frac{-2(y-0)}{1}=\frac{3(z-0)}{1}$

$\frac{x-1}{1}=\frac{y-0}{-\frac{1}{2}}=\frac{z-0}{\frac{1}{3}}$

∴ dir $=(1,-\frac{1}{2},\frac{1}{3})$
or $=(6,-3,2)$

∴ plane has 2 direction vectors

find $\vec{n}$

$\begin{vmatrix} i & j & k \\ 1 & -1 & -2 \\ 6 & -3 & 2 \end{vmatrix}$

$(-2-6,-12-2,-3+6)$

$\vec{n}=(-8,-14,3)$
or $(8,14,-3)$
A,B,C

sub pt.

$Ax+By+Cz+D=0$
$8(0)+14(1)+-3(2)+D=0$
$14-6+D=0$
$D=-8$

∴ $8x+14y-3z-8=0$ is the plane

11. The line of intersection of the planes π_1: $2x + y - 3z = 3$ and π_2: $x - 2y + z = -1$ is L.

a. Determine parametric equations for L.

b. If L meets the xy-plane at point A and the z-axis at point B, determine the length of line segment AB.

(a) (1) $2x+y-3z=3$

(2) $x-2y+z=-1$

$2\times(2)$ $2x-4y+2z=-2$

(1) $2x+y-3z=3$

$-5y+5z=-5$

$-y+z=-1$

let $y=t$

then $z=t-1$

and $x=2(t)-t+1-1$

$x=t$

(b)

$$L\begin{cases} x=t \\ y=t \\ z=t-1 \end{cases}$$

pt. $A(x,y,0)$ → $x=t$, $y=t$, $0=t-1$, $t=1$ ∴ pt $A(1,1,0)$

pt. $B(0,0,z)$ → $0=t$, $0=t$, $z=t-1$ ∴ pt. $B(0,0,-1)$

$|\vec{AB}| = \sqrt{1^2+1^2+1^2}$

$\sqrt{3} \sim 1.7$

∴ intersection $\vec{r} = (0,0,-1) + t(1,1,1)$

$x=t$

$y=t$

$z=t-1$