HW02 SOLNS

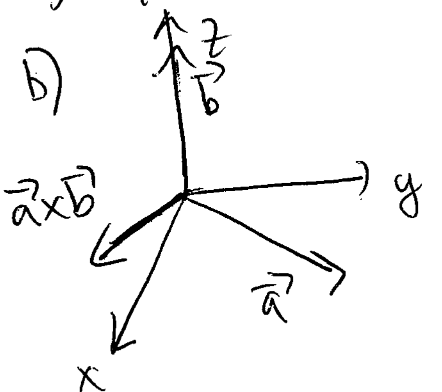
13.4: 10, 16, 22
13.5: 4, 46

13.4:10. $k \times (i - 2j) = k \times i - 2k \times j$
$= j + 2j \times k$
$= j + 2i.$

13.4:16: $|a| = 3$, $|b| = 2$,

a) $|\vec{a} \times \vec{b}| = |\vec{a}||\vec{b}|\sin(\pi/2) = 6.$

b)



x component of $\vec{a} \times \vec{b}$ is positive
y component of $\vec{a} \times \vec{b}$ is negative
z component of $\vec{a} \times \vec{b}$ is zero.

13.4:22: $(\vec{a} \times \vec{b}) \cdot \vec{b}$ = volume of parallelogram spanned by $\vec{a}, \vec{b}$ & $\vec{b}$.

$= 0.$ // (you can do this by direct computation)

13.5:4: Find the line through the point $\vec{r}_0 = (0, 14, -10)$ & parallel to the plane
$x = -1 + 2t$, $y = 6 - 3t$, $z = 3 + 9t$

soln. $\vec{r}(t) = (2, -3, 9)t + (0, 14, -10)$ //

13.5:46 Where does the line through the points $(1,0,1)$ & $(4,-2,2)$ intersect the plane $x+y+z=6$?

soln:

$$\vec{r}(t) = P_1 t + P_2(1-t)$$
$$= (1,0,1)t + (4,-2,2)(1-t)$$
$$= (t,0,t) + (4-4t, -2+2t, 2-2t)$$
$$= (4-3t, -2+2t, 2-t).$$

Find the time t such that

$$x(t) + y(t) + z(t) = 6.$$

$$(4-3t) + (-2+2t) + (2-t) = 6$$

$$\Rightarrow \quad 4 - 2t = 6 \Rightarrow \quad t = -1.$$

$\therefore$ The point of intersection is

$$\vec{r}(-1) = (4+3, -2-2, 2+1)$$
$$= (7, -4, 3). //$$