Calc 3 - Assignment 4

(1) Find area of parallelogram with vertices $A(-2,1)$, $B(0,4)$, $C(4,2)$, and $D(2,-1)$. Hint: to take cross products of $\mathbb{R}^2$ vectors, consider them embedded in $\mathbb{R}^3$ with z-coordinates 0. Thus, a vector $\langle a,b\rangle \in \mathbb{R}^2$ is equivalent to $\langle a,b,0\rangle \in \mathbb{R}^3$

(2) Find the parametric equation of the lines

a) through $(6,-5,2)$ parallel to $3\vec{i}+2\vec{j}-\vec{k}$

b) through $(1,2,3)$ and $(-4,3,0)$

c) through $(1,9,6)$ parallel to the line

$$\ell(t) = \langle 1+2t, 3+4t, 5+6t\rangle$$

d) through $(2,1,0)$, perpendicular to both $i+j$ and $j+k$

(3) Find the parametric equation in $\mathbb{R}^2$ of a line through $(-2,4)$ and $(3,9)$. Then find the traditional slope-intercept equation of the same line. Then come up with a hypothesis relating the parametric equation $\ell(t) = P + t\vec{v}$ with the slope of $y = mx+b$. Find the slopes of $\ell_1(t) = \langle 2,3\rangle + t\langle 2,6\rangle$ and $\ell_2(t) = (1+3t, 4+12t)$

(4) If $\ell(t) = \langle -1 - 2t, 3t, 1 + 4t \rangle$. Is $\langle -3, 3, 5 \rangle$ on that line? How about $\langle 1, -3, 1 \rangle$

(5) If two lines in $\mathbb{R}^2$ are not parallel, do they have to intersect? How about two non-parallel lines in $\mathbb{R}^3$?

(6) Can one line in $\mathbb{R}^3$ have <u>two different</u> parametric equations? Give examples.