Challenge Set #2

1. Find parametric equations of the line:

   a) that is parallel to the line $\frac{x+1}{-3}=\frac{y+2}{-2}=z+3$ and passes through the origin.

   $\{\, x=3t,\ y=2t,\ z=-t \,\}$

   b) that passes through Q(6,-4,5)and is parallel to the y axis. $\{\, x=6,\ y=-4+t,\ z=5 \,\}$

   c) that has a z intercept of -3 and direction vector $\vec{d}=(1,-3,6)$. $\{\, x=t,\ y=-3t, z=-3+6t \,\}$

2. Find the parametric equations of the line through $A(-3,2,3)$ and is perpendicular to both ℓ_1 *and* ℓ_2

   where $\ell_1 : \frac{x-4}{5}=y+2=\frac{z-3}{-4}$ and $\ell_2 : (x,y,z)=(-1,1,5)+k(-1,2,3)$

   $$\begin{cases} x=-3+t \\ y=2-t \\ 3+t \end{cases}$$

3. Given $\ell_1 : \frac{x-4}{5}=y+2=\frac{z-3}{-4}$,

a) Determine if the point A(14, 0, -5) is on ℓ_1.

b) Find a line ℓ_2 that also passes through point A.

c) How can you solve for point A, the point of intersection between ℓ_1 and ℓ_2?

4. Find the vector equation of the line that is parallel to $x=2t,\ y=3+t,\ z=1+t$ and has the same z-intercept as $\frac{x-6}{-3}=\frac{y+4}{2}=z-18$

5. Scalar equations of lines are not possible in $\Re^3$. Why not?

6. Show that the points A(-9, -3, -16) and B(6, 2, 14) lie on the line that passes through (0, 0, 2) and has direction vector (3, 1, 6)

7. Let $\ell_1 : (x,y,z)=(1,2,-3)+k(1,-1,1)$ and $\ell_2 : (x,y,z)=(5,-2,-3)+t(2,-2,-2)$ be two lines in 3-space. Show that the lines intersect, and find the values of the parameters *k* and *t* that produce the point of intersection