Planes - Homework

1. 1) A plane is defined by the points A(-1,-3,5), B(-2,-4,1) and C(-6,-4,-1)
   a) give two direction vectors for this plane $\{\overrightarrow{AB} = (-1,-1,-4)\ \overrightarrow{AC} = (-5,-1,-6)\}$
   b) find a normal for this plane $\{\vec{n} = (2,14,-4)\}$
   c) state the vector equation for this plane {(x,y,z)=(-1,-3,5)+k(-1,-1,-4)+m(-5,-1,-6)}
   d) state the parametric equations for this plane
   e) state the scalar equation for this plane {x+7y-2z+32=0}

2. Give parametric equations for the plane $\pi : 5x - 3y + 2z - 6 = 0$. {many answers}

3. Does the point P(4,5,-3) lie on the plane $\pi : (x, y, z) = (4,1,6) + t(3,-2,1) + k(-6,6,-1)$ {No}

4. Determine a vector equation of each of the following planes.
   a) The plane through the point G(-4,5,1) parallel to the vectors (-3,-5,3) and (2,-1,-5)
   b) The plane containing the two intersecting lines $\vec{r} = (4,3,7) + t(1,4,3)$ and $\vec{r} = (-1,-4,6) + s(-1,-1,3)$.
   c) The plane containing the line $\vec{r} = (-3,4,6) + t(-5,-2,3)$ and the point A(8,3,5).
   d) The plane containing the two parallel lines $\vec{r} = (0,1,3) + t(-6,-3,6)$ and $\vec{r} = (-4,5,-4) + s(4,2,-4)$.
   e) The plane containing P(2,6,-5), Q(-3,1,-4) and R(6,-2,2)

   $a)\ \vec{r} = (-4,5,1) + s(-3,-5,3) + t(2,-1,-5)$ $b)\ \vec{r} = (4,3,7) + s(1,4,3) + t(-1,-1,3)$
   $c)\ \vec{r} = (8,3,5) + s(5,2,-3) + t(11,-1,-1)$ $d)\ \vec{r} = (0,1,3) + s(2,1,-2) + t(4,-4,7)$
   $e)\ \vec{r} = (2,6,-5) + s(5,5,-1) + t(4,-8,7)$

5. Determine the parametric equations of the planes
   a) parallel to the xz plane containing the point J(6,4,2)
   b) the plane containing the origin and the points D(3,3,3) and E(8,-1,-1)
   c) the plane containing the x axis and the point J(-1,-4,7)

$\{a)\ x = 6 + s,\ y = 4,\ z = 2 + t \quad b)\ x = s + 8t,\ y = s - t,\ z = s - t \quad c)\ x = s - t,\ y = -4t,\ z = 7t\}$

6. What is the scalar equation of the plane containing the x axis and the point T(4,-2,1)? {y+2z=0}

7. Find the scalar equation of the plane that contains the intersecting lines
   $\frac{x-2}{1} = \frac{y}{2} = \frac{z+3}{3}$ *and* $\frac{x-2}{-3} = \frac{y}{4} = \frac{z+3}{2}$. {8x+11y-10z-46=0}

8. Find the scalar equation of the plane that contains the points
   a) G(1,1,-1), H(1,2,3) and I(3,-1,2) {11x+8y-2z-21=0}
   b) J(2,-2,4), K(1,1,-4) and L(3,1,-6) {x+3y+z=0}
   c) A(1,1,1), B(-1,1,1) and C(2,1,2) {y-1=0}