LINES

1. Find an equation for the line that goes through the two points $A(1, 0, -2)$ and $B(4, -2, 3)$.

2. Find an equation for the line that is parallel to the line $x = 3 - t$, $y = 6t$, $z = 7t + 2$ and goes through the point $P(0, 1, 2)$.

3. Find an equation for the line that is orthogonal to the plane $3x - y + 2z = 10$ and goes through the point $P(1, 4, -2)$.

4. Find an equation for the line of intersection of the planes $5x + y + z = 4$ and $10x + y - z = 6$.

PLANES

1. Find the equation of the plane that goes through the three points $A(0, 3, 4)$, $B(1, 2, 0)$, and $C(-1, 6, 4)$.

2. Find the equation of the plane that is orthogonal to the line
$x = 4 + t$, $y = 1 - 2t$, $z = 8t$ and goes through the point $P(3, 2, 1)$.

3. Find the equation of the plane that is parallel to the plane $5x - 3y + 2z = 6$ and goes through the point $P(4, -1, 2)$.

4. Find the equation of the plane that contains the intersecting lines
$x = 4 + t_1$, $y = 2t_1$, $z = 1 - 3t_1$ and
$x = 4 - 3t_2$, $y = 3t_2$, $z = 1 + 2t_2$.

5. Find the equation of the plane that is orthogonal to the plane $3x + 2y - z = 4$ and goes through the points $P(1, 2, 4)$ and $Q(-1, 3, 2)$.

LINES/PLANES/SPHERES AND INTERSECTIONS:

1. Find the intersection of the line
   $x = 3t$, $y = 1 + 2t$, $z = 2 - t$ and the plane
   $2x + 3y - z = 4$.

2. Find the intersection of the two lines
   $x = 1 + 2t_1$, $y = 3t_1$, $z = 5t_1$ and
   $x = 6 - t_2$, $y = 2 + 4t_2$, $z = 3 + 7t_2$
   (or explain why they don't intersect).

3. Find the intersection of the line
   $x = 2t$, $y = 3t$, $z = -2t$ and the sphere
   $x^2 + y^2 + z^2 = 16$.

4. Find the intersection of the plane $3y + z = 0$
   and the sphere $x^2 + y^2 + z^2 = 4$.