vector form: $x = 1 + 2t$, $y = 3 - 6t$, $z = -5 + t$

$\vec{v}(t) = \langle 1, 3, -5 \rangle + t\langle 2, -6, 1 \rangle =$

$\langle 1+2t, 3-6t, -5+t \rangle$

Equations of Lines

For problems 1 & 2 give the equation of the line in vector form, parametric form and symmetric form.

1. The line through the points $(2,-4,1)$ and $(0,4,-10)$.

2. The line through the point $(-7,2,4)$ and parallel to the line given by $x = 5-8t$, $y = 6+t$, $z = -12t$.

3. Is the line through the points $(2,0,9)$ and $(-4,1,-5)$ parallel, orthogonal or neither to the line given by $\vec{r}(t) = \langle 5, 1-9t, -8-4t \rangle$?

For problems 4 & 5 determine the intersection point of the two lines or show that they do not intersect.

4. The line given by $x = 8+t$, $y = 5+6t$, $z = 4-2t$ and the line given by $\vec{r}(t) = \langle -7+12t, 3-t, 14+8t \rangle$.

5. The line passing through the points $(1,-2,13)$ and $(2,0,-5)$ and the line given by $\vec{r}(t) = \langle 2+4t, -1-t, 3 \rangle$.

6. Does the line given by $x = 9+21t$, $y = -7$, $z = 12-11t$ intersect the xy-plane? If so, give the point.

7. Does the line given by $x = 9+21t$, $y = -7$, $z = 12-11t$ intersect the xz-plane? If so, give the point.

Equations of Planes

For problems 1 – 3 write down the equation of the plane.

1. The plane containing the points $(4,-3,1)$, $(-3,-1,1)$ and $(4,-2,8)$.

2. The plane containing the point $(3,0,-4)$ and orthogonal to the line given by $\vec{r}(t) = \langle 12-t, 1+8t, 4+6t \rangle$.

3. The plane containing the point $(-8,3,7)$ and parallel to the plane given by $4x+8y-2z = 45$.

For problems 4 & 5 determine if the two planes are parallel, orthogonal or neither.

4. The plane given by $4x-9y-z = 2$ and the plane given by $x+2y-14z = -6$.

5. The plane given by $-3x+2y+7z = 9$ and the plane containing the points $(-2,6,1)$, $(-2,5,0)$ and $(-1,4,-3)$.

For problems 6 & 7 determine where the line intersects the plane or show that it does not intersect the plane.

6. The line given by $\vec{r}(t) = \langle -2t, 2+7t, -1-4t \rangle$ and the plane given by $4x+9y-2z = -8$.

7. The line given by $\vec{r}(t) = \langle 4+t, -1+8t, 3+2t \rangle$ and the plane given by $2x-y+3z = 15$.

8. Find the line of intersection of the plane given by $3x+6y-5z = -3$ and the plane given by $-2x+7y-z = 24$.

9. Determine if the line given by $x = 8-15t$, $y = 9t$, $z = 5+18t$ and the plane given by $10x-6y-12z = 7$ are parallel, orthogonal or neither.

Equations of Lines

For problems 1 – 4 give the equation of the line in vector form, parametric form and symmetric form.

1. The line through the points $(7,-3,1)$ and $(-2,1,4)$.

2. The line through the point $(1,-5,0)$ and parallel to the line given by $\vec{r}(t)=\langle 8-3t,-10+9t,-1-t\rangle$.

3. The line through the point $(1,-7,14)$ and parallel to the line given by $x=6t$, $y=9$, $z=8-16t$.

4. The line through the point $(-7,2,4)$ and orthogonal to both $\vec{v}=\langle 0,-9,1\rangle$ and $\vec{w}=3\vec{i}+\vec{j}-4\vec{k}$.

For problems 5 – 7 determine if the two lines are parallel, orthogonal or neither.

5. The line given by $\vec{r}(t)=\langle 4-7t,-10+5t,21-4t\rangle$ and the line given by $\vec{r}(t)=\langle -2+3t,7+5t,5+t\rangle$.

6. The line through the points $(10,-4,18)$ and $(5,6,-7)$ and the line given by $x=5+3t$, $y=-6t$, $z=1+15t$.

7. The line given by $x=29$, $y=-3-6t$, $z=12-t$ and the line given by $\vec{r}(t)=\langle 12-14t,2+7t,-10+3t\rangle$.

For problems 8 – 10 determine the intersection point of the two lines or show that they do not intersect.

8. The line passing through the points $(0,-9,-1)$ and $(1,6,-3)$ and the line given by $\vec{r}(t)=\langle -9-4t,10+6t,1-2t\rangle$.

9. The line given by $x=1+6t$, $y=-1-3t$, $z=4+12t$ and the line given by $x=4+t$, $y=-10-8t$, $z=3-5t$.

10. The line given by $\vec{r}(t)=\langle 14+5t,-3t,1+7t\rangle$ and the line given by $\vec{r}(t)=\langle 3-3t,5+2t,-2+4t\rangle$.

11. Does the line passing through $(-5,4,-1)$ and $(-3,-5,0)$ intersect the *yz*-plane? If so, give the point.

12. Does the line given by $\vec{r}(t)=\langle 6+t,-8+14t,4t\rangle$ intersect the *xz*-plane? If so, give the point.

13. Which of the three coordinate planes does the line given by $x=16t$, $y=-4-9t$, $z=34$ intersect?