3-3

November 9, 2025

In Exercises 1-2, determine whether $\mathbf{u}$ and $\mathbf{v}$ are orthogonal vectors.

1 a)

$\mathbf{u} = (6, 1, 4)$, $\mathbf{v} = (2, 0, -3)$

c)

$\mathbf{u} = (3, -2, 1, 3)$, $\mathbf{v} = (-4, 1, -3, 7)$

In Exercises 3-6, find a point-normal form of the equation of the plane passing through P and having $\mathbf{n}$ as a normal.

3

$P(-1, 3, -2); \mathbf{n} = (-2, 1, -1)$

In Exercises 7-10, determine whether the given planes are parallel.

7

$4x - y + 2z = 5$ and $7x - 3y + 4z = 8$

9

$2y = 8x - 4z + 5$ and $x = \frac{1}{2}z + \frac{1}{4}y$

In Exercises 11-12, determine whether the given planes are perpendicular.

11

$3x - y + z - 4 = 0$ $x + 2z = -1$

In Exercises 13-14, find $\|\text{proj}_{\mathbf{a}}\mathbf{u}\|$

13 b)

$\mathbf{u} = (3, 0, 4)$ $\mathbf{a} = (2, 3, 3)$

In Exercises 15-20, find the vector component of $\mathbf{u}$ along $\mathbf{a}$ and the vector component of $\mathbf{u}$ orthogonal to $\mathbf{a}$.

17

$\mathbf{u} = (3, 1, -7)$ $\mathbf{a} = (1, 0, 5)$

In Exercises 21-24, find the distance between the point and the line.

21

$(-3, 1)$; $4x + 3y + 4 = 0$

In Exercises 25-26, find the distance between the point and the plane.

25

$(3, 1, -2)$. $x + 2y - 2z = 4$

In Exercises 27–28, find the distance between the given parallel planes.

27

$2x - y - z = 5$ and $-4x + 2y + 2z = 12$

Answers

1. (a) Orthogonal
   (b) Not orthogonal
   (c) Not orthogonal
   (d) Not orthogonal
   3. $-2(x+1)+(y-3)-(z+2)=0$
   7. Not parallel
   9. Parallel
   11. Not perpendicular
   13. (a) $\frac{2}{5}$ (b) $\frac{18}{\sqrt{22}}$
   15. $(0,0)$, $(6,2)$
   17. $\left(-\frac{16}{13},0,-\frac{80}{13}\right)$, $\left(\frac{55}{13},1,-\frac{11}{13}\right)$
   19. $\left(\frac{1}{5},-\frac{1}{5},\frac{1}{10},-\frac{1}{10}\right)$, $\left(\frac{9}{5},\frac{6}{5},\frac{9}{10},\frac{21}{10}\right)$
   21. 1
   23. $\frac{1}{\sqrt{17}}$
   25. $\frac{5}{3}$
   27. $\frac{11}{\sqrt{6}}$