Let $\vec{u} = \langle 2, 3, -4 \rangle$ and $\vec{v} = \langle -3, 1, -2 \rangle$.

1. Determine $\|\vec{v}\|$.

2. Determine $\vec{u} - 2\vec{v}$.

3. Determine $\vec{u} \bullet \vec{v}$.

4. Determine $\vec{u} \times \vec{v}$.

Let $\vec{u} = \langle 5, 2, -1 \rangle$ and $\vec{v} = \langle 3, -3, 0 \rangle$.

5. Determine $\|\vec{v}\|$.

6. Determine $2\vec{u} - \vec{v}$.

7. Determine $\vec{u} \bullet \vec{v}$.

8. Determine $\vec{u} \times \vec{v}$.

9. Let $\vec{u} = \langle 2, 3, -4 \rangle$ and $\vec{v} = \langle -3, 1, -2 \rangle$.
   Determine the measure of the angle between $\vec{u}$ and $\vec{v}$ to the nearest tenth of a degree.

10. Let $\vec{u} = \langle 5, 2, -1 \rangle$ and $\vec{v} = \langle 3, -3, 0 \rangle$.
    Determine the measure of the angle between $\vec{u}$ and $\vec{v}$ to the nearest tenth of a degree.

Let P be the point with rectangular coordinates $\left(1, \sqrt{3}, 2\right)$.

11. Find cylindrical coordinates for P.

12. Find spherical coordinates for P.

Let P be the point with rectangular coordinates $\left(\sqrt{3},\ 1,\ 2\right)$.

13. Find cylindrical coordinates for P.

14. Find spherical coordinates for P.

15. Consider the system $\begin{cases} 4x + 2y - 2z = \pm 3 \\ 2x - 2y - 2z = \pm 3 \\ x + 2y + z = 3 \end{cases}$.
Solve the system.

16. Consider the system $\begin{cases} 4x + 2y - 2z = \pm 3 \\ 2x + y - z = \pm 3 \\ x + 2y + z = 2 \end{cases}$.
Solve the system.

17. For three-dimensional vectors $\vec{u}$ and $\vec{v}$, prove that $\vec{u} \times \vec{v} \neq \vec{v} \times \vec{u}$.

18. For three-dimensional vectors $\vec{u}$, $\vec{v}$, and $\vec{w}$, prove that $\vec{u} \bullet \left(\vec{v} + \vec{w}\right) = \left(\vec{u} \bullet \vec{v}\right) + \left(\vec{u} \bullet \vec{w}\right)$.

Let $\vec{u} = \left\langle 2, 2, t \right\rangle$. Find t such that $\vec{u}$ and the vector $\vec{v} = \left\langle \pm 3, \pm 3, 1 \right\rangle$ are

19. orthogonal.

20. parallel.

Let $\vec{u} = \left\langle t, 2, -2 \right\rangle$. Find t such that $\vec{u}$ and the vector $\vec{v} = \left\langle 3, 1, -1 \right\rangle$ are

21. orthogonal.

22. parallel.

23. A 6-foot pole designed to suspend a flag from a wall bracket has a 2-pound steel star at its tip. In the bracket, the pole makes an angle of 45° with the ground. What is the magnitude of the torque at the bracket produced by the weight of the star?

24. A crane with a 40-meter arm is raised to an angle of 50° with the ground. What is the magnitude of the torque at the pivot point of the arm if the crane is lifting a crate weighing 60 kilograms?

25. Let $\vec{u} = \langle 2, 3, -4 \rangle$ and $\vec{v} = \langle -3, 1, -2 \rangle$.
Sketch $\vec{u}$, $\vec{v}$, and $\vec{u} \times \vec{v}$.

26. Let $\vec{u} = \langle 5, 2, -1 \rangle$ and $\vec{v} = \langle 3, -3, 0 \rangle$.
Sketch $\vec{u}$, $\vec{v}$, and $\vec{u} \times \vec{v}$.

Consider the plane orthogonal to the vector $\vec{u} = \langle 3, 2, -1 \rangle$ and containing the point $(1, 4, \pm 2)$.

27. Find an equation for the plane in standard form.

28. Find an equation for the line perpendicular to the plane and passing through $(4, \pm 1, \pm 1)$.

Consider the plane orthogonal to the vector $\vec{u} = \langle 1, 3, -1 \rangle$ and containing the point $(1, 2, \pm 1)$.

29. Find an equation for the plane in standard form.

30. Find an equation for the line perpendicular to the plane and passing through $(2, \pm 2, \pm 1)$.

31. Consider the system $\begin{cases} 4x + 2y - 2z = \pm 3 \\ 2x - 2y - 2z = \pm 3 \\ x + 2y + z = 3 \end{cases}$.
For positive x, y, and z, sketch the portion of the plane determined by the third equation.

32. Consider the system $\begin{cases} 4x + 2y - 2z = \pm 3 \\ 2x + y - z = \pm 3 \\ x + 2y + z = 2 \end{cases}$.

For positive x, y, and z, sketch the portion of the plane determined by the third equation.

33. Consider the system $\begin{cases} 4x + 2y - 2z = \pm 3 \\ 2x - 2y - 2z = \pm 3 \\ x + 2y + z = 3 \end{cases}$.

Give a geometric interpretation of the system and its solution.

34. Consider the system $\begin{cases} 4x + 2y - 2z = \pm 3 \\ 2x + y - z = \pm 3 \\ x + 2y + z = 2 \end{cases}$.

Give a geometric interpretation of the system and its solution.