

p. 824 (10.4)

Compute the cross product $\vec{a} \times \vec{b}$.

9. $\vec{a} = \langle 1, 2, -1 \rangle$, $\vec{b} = \langle 1, 0, 2 \rangle$

11. $\vec{a} = \langle 0, 1, 4 \rangle$, $\vec{b} = \langle -1, 2, -1 \rangle$

13. $\vec{a} = \langle -2, -1, 4 \rangle$, $\vec{b} = \langle 1, 0, 0 \rangle$

15. $\vec{a} = 2\vec{i} - \vec{k}$, $\vec{b} = 4\vec{j} + \vec{k}$

Find two unit vectors orthogonal to the two given vectors.

17. $\vec{a} = \langle 1, 0, 4 \rangle$, $\vec{b} = \langle 1, -4, 2 \rangle$

19. $\vec{a} = \langle 2, -1, 0 \rangle$, $\vec{b} = \langle 1, 0, 3 \rangle$

21. $\vec{a} = 3\vec{i} - \vec{j}$, $\vec{b} = 4\vec{j} + \vec{k}$

Use the cross product to determine the angle between the vectors.

23. $\vec{a} = \langle 1, 0, 4 \rangle$, $\vec{b} = \langle 2, 0, 1 \rangle$

25. $\vec{a} = 3\vec{i} + \vec{k}$, $\vec{b} = 4\vec{j} + \vec{k}$

Find the distance from point Q to the given line.

27. $Q = (1, 2, 0)$, line through $(0, 1, 2)$ and $(3, 1, 1)$

29. $Q = (3, -2, 1)$, line through $(2, 1, -1)$ and $(1, 1, 1)$

31. If you apply a force of magnitude 20 pounds at the end of an 8-inch-long wrench at an angle of $\frac{\pi}{4}$ to the wrench, find the magnitude of the torque applied to the bolt.

33. If you apply a force of magnitude 30 pounds at the end of an 8-inch-long wrench at an angle of $\frac{\pi}{6}$ to the wrench, find the magnitude of the torque applied to the bolt.

Assume that the balls are moving into the page (and away from you) with the indicated spin. Determine the direction of the Magnus force.

35.



39.



A sports situations is described, with the typical ball spin shown in the indicated exercise above. Discuss the effects on the ball and how the game is affected.

43. Baseball overhand fastball, spin in exercise 35

45. Baseball right-handed “three-quarters” curveball, spin in exercise 39

Find the indicated area or volume.

63. Area of the parallelogram with two adjacent sides formed by $\langle 2, 3 \rangle$ and $\langle 1, 4 \rangle$

65. Area of the triangle with vertices $(0, 0, 0)$, $(2, 3, -1)$ and $(3, -1, 4)$

67. Volume of the parallelepiped with three adjacent edges formed by $\langle 2, 1, 0 \rangle$, $\langle -1, 2, 0 \rangle$ and $\langle 1, 1, 2 \rangle$

Use the parallelepiped volume formula to determine if the vectors are coplanar.

75. $\langle 2, 3, 1 \rangle$, $\langle 1, 0, 2 \rangle$ and $\langle 0, 3, -3 \rangle$