Precalculus

Vectors in Space

Lesson 10.6

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Given $\mathbf{u} = \langle 3, 5 \rangle$ and $\mathbf{v} = \langle -4, -7 \rangle$, find each of the following.

1. $\mathbf{u} \cdot \mathbf{v}$ _____ 2. the norm of $\mathbf{v}$ _____ 3. the angle between $\mathbf{v}$ and $\mathbf{w}$ _____

ADDITIONAL PRACTICE

Given $\mathbf{u} = \langle 2, 5, 7 \rangle$, $\mathbf{v} = \langle 12, -6, -9 \rangle$, $\mathbf{w} = \langle -3, -4, 6 \rangle$, $a = 4$, $b = -2$, and $c = \frac{1}{3}$, find each of the following.

4. $\mathbf{u} + \mathbf{v}$ _____ 5. $\mathbf{v} + \mathbf{w}$ _____ 6. $\mathbf{w} - \mathbf{v}$ _____

7. $\mathbf{u} \cdot \mathbf{v}$ _____ 8. $\mathbf{u} \cdot \mathbf{w}$ _____ 9. $a\mathbf{u} + c\mathbf{v}$ _____

10. $\mathbf{u} \times \mathbf{v}$ _____ 11. $-\mathbf{w} \times \mathbf{u}$ _____ 12. $b\mathbf{u} \times a\mathbf{w}$ _____

Determine the angle between the vectors.

13. $\mathbf{v} = 3i + 6j - 7k$, $\mathbf{w} = -3i + 2j + 4k$ _____ 14. $\mathbf{v} = \sqrt{3}i + j - 9k$, $\mathbf{w} = 5i - 9j + k$ _____

VECTOR APPLICATIONS

1. If forces of 220 and 180 lb make an angle of 46° with each other, determine the magnitude of the resultant force.
2. If forces of 175.6 lb and 193.8 lb act on an object with resultant force 347.2 lb, determine the angle that the resultant force makes with the lesser force.
3. A ship leaves port and sails west for 120 km, then south for 40 km. What are the distance and the bearing of the ship from the port?
4. A plane flies due east for 500 km and then on a heading of 120° for 150 km. What are its distance and bearing from its starting point?
5. A plane heads due east with an air speed of 300 km/h. A 45 km/h wind is blowing with a bearing 150°. Find the plane's course and ground speed.

1. -47
3. $178.8°$
5. $\langle 9, -10, -3 \rangle$
7. -69
9. $\langle 12, 18, 25 \rangle$

11. $\langle 58, -33, 7 \rangle$
13. $118.6°$

1. 369 lb.
3. $d = 126.49$ km. bearing $= 251.57°$
5. $d = 324.85$ km; course $96.89°$