Section V.3: Dot Product

Exercises

Find the dot product **A·B** of the following vectors.

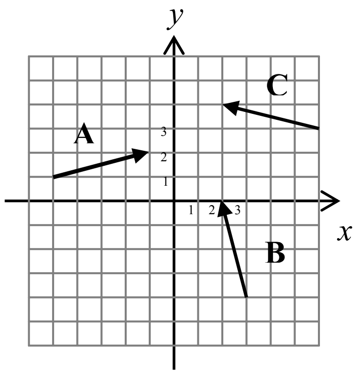
1. **A** has components $A_x = -3$, $A_y = 6$; **B** has components $B_x = -5$, $B_y = -6$.
2. **A** has components $A_x = 17$, $A_y = 34$; **B** has components $B_x = 16$, $B_y = -8$.
3. **A** = 3**i**, **B** = **j**
4. **A** = **i**, **B** = 2**i**
5. **A** = 3**i** + **j**, **B** = 7**i** – 2**j**
6. **A** = 4**i** – 3**j**, **B** = **i**
7. **A** = –3**i** + 2**j**, **B** = –8**j**
8. **A** = **i** + **j**, **B** = 2**i** – 2**j**
9. **A** = 3**i** + **j** –2**k**, **B** = 2**i** + 3**k**
10. **A** = 12**i** – 9**j** – 10**k**, **B** = 3**i** + **j** – 4**k**
11. **A** = 3 units at 45º, **B** = 4 units at 210º
12. **A** = 4.5 units at –15º, **B** = 10 units at 345º
13. **A** = 2 units at –60º, **B** = –3**i** – 3**j**
14. **A** = 7**i**, **B** = 4 units at 150º

Calculate the magnitude of the following vectors using the dot product.

15. **A** has components $A_x = -3$, $A_y = 6$
16. **B** has components $B_x = 16$, $B_y = -8$.
17. **A** = 7**i** – 24**j**
18. **D** = 5**i** + 8**j**
19. **F** = –8**i** – 12**j**
20. **W** = 15**i** – 8**j**
21. **N** = 3**i** + **j** –2**k**

22. **A** = 12**i** – 9**j** – 10**k**

23. Using the vectors in the diagram below, calculate **A·B, A·C,** and **B·C**.



Are the following pairs of vectors perpendicular? Use the dot product to determine your answer.

24. **A** has components $A_x = 4$, $A_y = 7$; **B** has components $B_x = -7$, $B_y = -4$.

25. **A** = 3**i** + **j**, **B** = 7**i** – 2**j**

26. **A** = 5**i** + 3**j**, **B** = 5**i** – 3**j**

27. **A** = 5**i** + 3**j**, **B** = 3**i** – 5**j**

28. **A** = 3**i** + **j** – 2**k**, **B** = 7**i** – 2**j** + **k**

29. **A** = 5**i** – 3**j** + 4**k**, **B** = –2**i** – 2**j** + **k**

30. Using your answer for #23, are any of these pairs of vectors perpendicular?

Find the angle between each pair of vectors.

31. **A** = 3**i** + **j**, **B** = **i** – 2**j**

32. **A** = 3**i**, **B** = 7**i** – 6**j**

33. **A** = **i** + **j** + **k**, **B** = 2**i** – **j** – 3**k**

34. **A** = **i** + **k**, **B** = **j** – **k**

35. **A** = 2**i** + **j** – 3**k**, **B** = –6**i** – 3**j** + 9**k**