

## 4. Quiz

Some questions might have more than one correct answer.

- The magnitude of the sum of two vectors must be
  - greater than the magnitude of either of the vectors
  - less than the magnitude of either of the vectors
  - equal to the sum of the magnitudes of the vectors
  - equal to the square root of the sum of the squares of the magnitudes of the vectors
  - none of the above
- The magnitude of the difference of two vectors must be
  - greater than the magnitude of either of the vectors
  - less than the magnitude of either of the vectors
  - equal to the sum of the magnitudes of the vectors
  - equal to the square root of the sum of the squares of the magnitudes of the vectors
  - none of the above
- If three vectors form a triangle, with the head of each vector at the tail of another,
  - the magnitude of the sum of the three vectors is the square root of the sum of the squares of the three magnitudes
  - the magnitude of the sum of the three vectors is the sum of the three magnitudes
  - any one of the vectors is the sum of the other two
  - the magnitude of any one of three vectors is the sum of the magnitudes of the other two
  - the magnitude of the sum of the three vectors is zero
- Rank the following vectors according to their magnitudes, least to greatest.  $a$  and  $b$  are positive numbers.

- I.  $a\hat{i} + b\hat{j}$
- II.  $a\hat{i} - b\hat{j}$
- III.  $(a + b)\hat{i}$
- IV.  $(a - b)\hat{i}$

(a) IV, I and II tie, then III

(b) II, III and IV tie, then I

(c) IV, II, I, III

(d) I and II tie, then III and IV tie

(e) all tie

5. Which of the following is NOT a vector quantity?

(a) force

(b) velocity

(c) temperature

(d) acceleration

(e) displacement

6. Which of the following statements are true?

(a) unit vectors do not have units

(b) all the components of a vector have the same units

(c) the sum of any two of the unit vectors  $\hat{i}$ ,  $\hat{j}$ , and  $\hat{k}$  is parallel to a coordinate axis

(d) the difference of any two of the unit vectors  $\hat{i}$ ,  $\hat{j}$ , and  $\hat{k}$  is zero

(e) any vector and its negative are in opposite directions

7. The  $y$  component of a vector in the  $xy$  plane is negative only if

(a) the angle between the vector and the positive  $x$  direction, measured counterclockwise from that direction, is less than  $90^\circ$

- (b) the angle between the vector and the positive  $x$  direction, measured counterclockwise from that direction, is greater than  $90^\circ$  and less than  $180^\circ$
- (c) the angle between the vector and the positive  $y$  direction, measured counterclockwise from that direction, is less than  $90^\circ$
- (d) the angle between the vector and the positive  $y$  direction, measured counterclockwise from that direction, is greater than  $90^\circ$
- (e) the  $x$  component of the vector is zero

8. Two vectors in the  $xy$  plane have the same  $x$  components but different  $y$  components. All components are positive. As a result,

- (a) their sum is parallel to the  $x$  axis
- (b) their sum is parallel to the  $y$  axis
- (c) their difference is parallel to the  $x$  axis
- (d) their difference is parallel to the  $y$  axis
- (e) they make the same angle with the positive  $x$  axis

9. Two vectors are equal if

- (a) their  $x$  components are equal, their  $y$  components are equal, and their  $z$  components are equal
- (b) their magnitudes are equal
- (c) they make the same angle with the positive  $x$  direction
- (d) their magnitudes are equal and they make the same angle with the positive  $x$  direction
- (e) their magnitudes are equal and they are perpendicular to each other

10. The product of a scalar and a vector

- (a) has a magnitude that must be larger than the magnitude of the vector
- (b) must be in the same direction as the vector
- (c) is not defined

(d) has a magnitude that is equal to the product of the magnitude of the scalar and the magnitude of the original vector

has components that are the products of the scalar and the components of the original vector

(e)

11. If  $\vec{A}$  and  $\vec{B}$  are perpendicular to each other

$$A^2 = B^2$$

(a)

(b)  $|\vec{A} + \vec{B}|^2 = A^2 + B^2$

(c)  $|\vec{A} - \vec{B}|^2 = A^2 - B^2$

(d)  $|\vec{A} - \vec{B}|^2 = A^2 + B^2$

(e)  $|\vec{A} + \vec{B}| = A + B$

Answers: (1) E; (2) E; (3) E; (4) A (5) C; (6) A, E; (7) D; (8) D; (9) A, D; (10) D, E; (11) B