Classroom Voting Questions: Multivariable Calculus

13.3 The Dot Product

1. The only way that $\vec{v} \cdot \vec{w} = 0$ is if $\vec{v} = 0$ or $\vec{w} = 0$.

   (a) True, and I am very confident
   (b) True, but I am not very confident
   (c) False, but I am not very confident
   (d) False, and I am very confident

2. The zero vector $\vec{0}$ (with magnitude $||\vec{0}|| = 0$) is perpendicular to all other vectors.

   (a) True, and I am very confident
   (b) True, but I am not very confident
   (c) False, but I am not very confident
   (d) False, and I am very confident

3. Any plane has only two distinct normal vectors

   (a) True, and I am very confident
   (b) True, but I am not very confident
   (c) False, but I am not very confident
   (d) False, and I am very confident

4. Parallel planes share a same normal vector.

   (a) True, and I am very confident
   (b) True, but I am not very confident
   (c) False, but I am not very confident
   (d) False, and I am very confident

5. Perpendicular planes have perpendicular normal vectors.

(a) True, and I am very confident

(b) True, but I am not very confident

(c) False, but I am not very confident

(d) False, and I am very confident

6. What is the angle between the vectors $\langle\sqrt{3}, 1\rangle$ and $\langle-\sqrt{3}, 1\rangle$?

(a) 30 degrees

(b) 60 degrees

(c) 90 degrees

(d) 120 degrees

(e) 150 degrees

(f) None of the above

7. The angle between the vectors $-x\hat{i} - \hat{j} + \hat{k}$ and $x\hat{i} + 2\hat{j} - 3\hat{k}$:

(a) is 0 degrees

(b) is less than 90 degrees

(c) is greater than 90 degrees

(d) can be any of the above depending on the value of x.

8. Two vectors have a dot product of 14. To guarantee the dot product is equal to 28, you could:

(a) double the angle between the vectors

(b) double the length of both vectors

(c) double the length of one vector

(d) none of the above

9. Which of the following is a point in the plane parallel to $3x + 4y - 2z = 6$ containing the origin?

(a) (1,1,1)

(b) (1,2,3)

(c) (3,2,1)

(d) none of the above

10. In 2 space, consider the vector $\vec{v} = 5\hat{i} + 7\hat{j}$. For which unit vector below will the component of $\vec{v}$ perpendicular to that unit vector be largest?

    (a) $\hat{i}$
    (b) $(\hat{i} - \hat{j})/\sqrt{2}$
    (c) $\hat{j}$
    (d) $(\hat{i} + \hat{j})/\sqrt{2}$

11. A 100-meter dash is run on a track heading northeasterly. If the wind is blowing out of the south at a speed of 8 km/hr. The rules say that a legal wind speed measured in the direction of the dash must not exceed 5 km/hr. Will the race results be disqualified due to an illegal wind?

    (a) Yes, the race results will be disqualified because the wind exceeds 5 km/hr in the direction of the race.
    (b) No, the race results will not be disqualified because the wind does not exceed 5 km/hr in the direction of the race.
    (c) There is not enough information to answer this question.

12. A 100-meter dash is run on a track in the direction of the unit vector $\vec{v} = \frac{1}{\sqrt{2}}\hat{i} + \frac{1}{\sqrt{2}}\hat{j}$. If the wind velocity $\vec{w}$ is $\vec{w} = 5\hat{i} + 1\hat{j}$ km/hr. The rules say that a legal wind speed measured in the direction of the dash must not exceed 5 km/hr. Will the race results be disqualified due to an illegal wind?

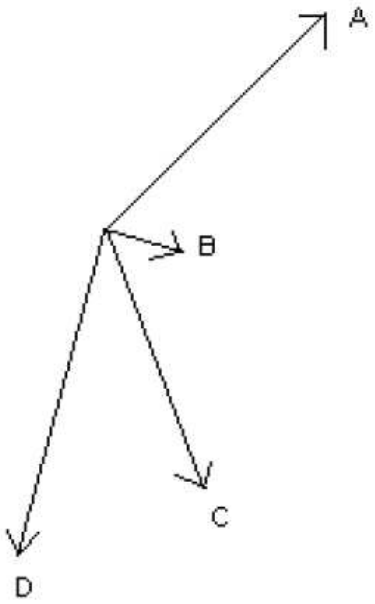
    (a) Yes, the race results will be disqualified because the wind exceeds 5 km/hr in the direction of the race.
    (b) No, the race results will not be disqualified because the wind does not exceed 5 km/hr in the direction of the race.
    (c) There is not enough information to answer this question.

13. A 100-meter dash is run on a track in the direction of the vector $\vec{v} = 2\hat{i} + 6\hat{j}$. The wind velocity is $\vec{w} = 5\hat{i} + \hat{j}$ km/hr. The rules say that a legal wind speed measured in the direction of the dash must not exceed 5 km/hr. Will the race results be disqualified due to an illegal wind?

    (a) Yes, the race results will be disqualified because the wind exceeds 5 km/hr in the direction of the race.
    (b) No, the race results will not be disqualified because the wind does not exceed 5 km/hr in the direction of the race.

(c) There is not enough information to answer this question.

14. The picture shown is in 2 space. If the force vector is $\vec{F} = -4\hat{j}$, the total work to which point will be the most positive?



(a) A

(b) B

(c) C

(d) D

15. An equation of the plane with normal vector $\hat{i} + \hat{j} + \hat{k}$ containing the point (1, 2, 3) is $z = x + y$.

(a) True, and I am very confident

(b) True, but I am not very confident

(c) False, but I am not very confident

(d) False, and I am very confident

16. Which of the following vectors is normal to the plane $z = -3x + 4y + 25$?

(a) $\langle 3, -4, 1 \rangle$

(b) $\langle -3, 4, 1 \rangle$

(c) $\langle -3, 4, 25 \rangle$

(d) $\langle -3, 4, -1 \rangle$

(e) More than one of the above

17. For any two vectors $\vec{u}$ and $\vec{v}$, $\vec{u} \cdot \vec{v} = \vec{v} \cdot \vec{u}$.

(a) True, and I am very confident

(b) True, but I am not very confident

(c) False, but I am not very confident

(d) False, and I am very confident

18. For any two vectors $\vec{u}$ and $\vec{v}$ and any scalar k, it is true that $k(\vec{u} \cdot \vec{v}) = (k\vec{u}) \cdot \vec{v}$.

(a) True, and I am very confident

(b) True, but I am not very confident

(c) False, but I am not very confident

(d) False, and I am very confident