13.1 Displacement Vectors

1. The length of the sum of two vectors is always strictly larger than the sum of the lengths of the two 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

2. \(|\vec{v}| = |v_1| + |v_2| + |v_3|\), where \(\vec{v} = v_1\vec{i} + v_2\vec{j} + v_3\vec{k}\).
   
   (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. \(\vec{v}\) and \(\vec{w}\) are parallel if \(\vec{v} = \lambda \vec{w}\) for some scalar \(\lambda\)
   
   (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. Any two parallel vectors point in the same direction.
   
   (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. Any two points determine a unique displacement vector.
6. $2\vec{v}$ has twice the magnitude as $\vec{v}$

(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

7. In the picture, the unlabelled vector is closest to

(a) $v + w$
(b) $v - w$
(c) $v + 2w$
(d) $2v + w$

8. A “unit vector” is a vector with a magnitude of one. The vectors $\hat{i} = \langle 1, 0, 0 \rangle$, $\hat{j} = \langle 0, 1, 0 \rangle$ and $\hat{k} = \langle 0, 0, 1 \rangle$ are unit vectors that point in the $x$, $y$, and $z$ directions, respectively.

**True or False:** The vector $\langle \frac{1}{2}, \frac{1}{2} \rangle$ is a unit 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

9. **True or False:** The vector \( \frac{1}{\sqrt{3}} \hat{i} - \frac{1}{\sqrt{3}} \hat{j} + \frac{2}{\sqrt{3}} \hat{k} \) is a unit 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

10. Which of the following is a unit vector that is parallel to the vector \( \langle 1, -2, 3 \rangle \)?

(a) \( \langle \frac{1}{6}, -\frac{2}{6}, \frac{3}{6} \rangle \)  
(b) \( \langle \frac{1}{\sqrt{14}}, -\frac{2}{\sqrt{14}}, \frac{3}{\sqrt{14}} \rangle \)  
(c) \( \langle \frac{1}{14}, -\frac{2}{14}, \frac{3}{14} \rangle \)  
(d) \( \langle -\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, -\frac{3}{\sqrt{14}} \rangle \)  
(e) More than one of the above

11. The vectors \( 2\hat{i} - \hat{j} + \hat{k} \) and \( \hat{i} - 2\hat{j} + \hat{k} \) are parallel.

(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

12. Find a vector that points in the same direction as the vector \( \langle 2, 1, 2 \rangle \), but has a magnitude of 5.

(a) \( \langle \frac{10}{3}, \frac{5}{3}, \frac{10}{3} \rangle \)  
(b) \( \langle \frac{10}{\sqrt{3}}, \frac{5}{\sqrt{3}}, \frac{10}{\sqrt{3}} \rangle \)  
(c) \( \langle \frac{5}{\sqrt{3}}, \frac{5}{\sqrt{3}}, \frac{5}{\sqrt{3}} \rangle \)  
(d) \( \langle 10, 5, 10 \rangle \)  
(e) \( \langle 30, 15, 30 \rangle \)  
(f) More than one of the above