

Math 122 - #31
3 Space - Vectors

1. Find the distance between $P = (-1, 3, 3)$ and $Q = (-2, 3, 4)$
2. Find the equation of the sphere of radius 3 centered at $P_0 = (1, 3, 4)$
3. Is the point $Q = (1, 1, 3)$ inside or outside the sphere in problem 3?
4. Find the radius and center of the sphere

$$x^2 + y^2 + z^2 + 2x - 2y = 2$$

5. Find the radius and center of the sphere

$$x^2 + y^2 + z^2 + 2x - 2z = -1$$

6. Find the standard equation for the sphere that has points $(4, -3, 5)$ and $(-6, 1, -1)$ as endpoints of a diameter.
7. Given $\vec{u} = 3\mathbf{i} + 2\mathbf{j}$, $\vec{w} = \mathbf{i} - \mathbf{j}$, and $\vec{v} = 3\vec{u} - 2\vec{w}$ find \vec{v}
8. Given $\vec{u} = 3\mathbf{i} - 2\mathbf{j}$, $\vec{w} = 9\mathbf{i} + 5\mathbf{j}$, and $\vec{v} = \frac{1}{2}\vec{u} + 4\vec{w}$ find \vec{v}
9. Find a unit vector in the direction of $\vec{v} = \langle 3, -2 \rangle$.
10. Find a vector with length 3 in the direction of $\vec{v} = \langle 1, 2 \rangle$.

For $\vec{a} = \langle 2, 5, -4 \rangle$ and $\vec{b} = \langle 1, -2, -3 \rangle$ find:

11. $2\vec{a} + \vec{b}$
12. $3\vec{a} - 4\vec{b}$
13. $\|\vec{a} + \vec{b}\|$
14. $\vec{e} \cdot \vec{a}$

Answers

1. $d = \sqrt{2}$

2. $(x - 1)^2 + (y - 3)^2 + (z - 4)^2 = 9$

3. inside.

4. center $(-1, 1, 0)$ and radius 2

5. center $(-1, 0, 1)$ and radius 1

6. $(x + 1)^2 + (y + 1)^2 + (z - 2)^2 = 38$

7. $\langle 7, 8 \rangle$

8. $\langle \frac{75}{2}, 19 \rangle$

9. $\langle \frac{3\sqrt{13}}{13}, -\frac{2\sqrt{13}}{13} \rangle$

10. $\langle \frac{3}{\sqrt{5}}, \frac{6}{\sqrt{5}} \rangle$

11. $\langle 5, 8, -11 \rangle$

12. $\langle 2, 23, 0 \rangle$

13. $\sqrt{67}$

14. $\frac{1}{\sqrt{45}} \langle 2, 5, -4 \rangle$