

---

**Wir 1: 12.1 to 12.3**

**Problem 1.** Find the center and radius of the sphere  $x^2 + y^2 + z^2 + 4x - 2y - 8z = 5$ . Does this sphere intersect the  $xz$  plane? If so, what is the intersection?

**Problem 2.** Find equation of the sphere with center  $(1, 2, 5)$  that touches the  $xy$  plane.

Instructor: Rosanna Pearlstein

Math 251 – Spring 2023  
“Week-in-Review”

**Problem 3.** Find the equation of the sphere if one of their diameters has endpoints  $(5, 1, 5)$  and  $(7, 3, 9)$ .

**Problem 4.** What does  $y = 6 - x$  represent in  $\mathbb{R}^3$ ?

Instructor: Rosanna Pearlstein

Math 251 – Spring 2023  
“Week-in-Review”

Problem 5. What does  $x^2 + z^2 = 16$  represent in  $\mathbb{R}^3$ ?

Problem 6. Write a set of inequalities that describes the solid upper hemisphere  $x^2 + y^2 + z^2 = 9$ .

## SECTION 12.2

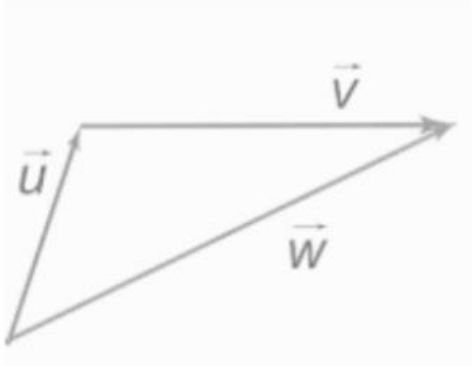
Problem 7. Give a graphical interpretation of vector sum and vector difference.

Problem 8. Given  $\mathbf{a} = \langle -7, 1, 2 \rangle$  and  $\mathbf{b} = \langle 5, -1, 1 \rangle$ , find a unit vector in the direction of  $\mathbf{a} + 2\mathbf{b}$ .

Instructor: Rosanna Pearlstein

Math 251 – Spring 2023  
“Week-in-Review”

Problem 9. For the picture seen below, write  $\vec{v}$  in terms of  $\vec{u}$  and  $\vec{w}$ .



Instructor: Rosanna Pearlstein

Math 251 – Spring 2023  
“Week-in-Review”

## SECTION 12.3

**Problem 10.** Compute  $\mathbf{a} \cdot \mathbf{b}$  if

- a.)  $\mathbf{a} = \langle 4, 5, -1 \rangle$  and  $\mathbf{b} = \langle 2, 1, 3 \rangle$ .
- b.)  $|\mathbf{a}| = 2$ ,  $|\mathbf{b}| = 5$  and  $\theta = 120^\circ$ .
- c.)  $|\mathbf{a}| = 6$ ,  $|\mathbf{b}| = 4$  and  $\mathbf{a}$  is perpendicular to  $\mathbf{b}$ .
- d.)  $|\mathbf{a}| = 6$ ,  $|\mathbf{b}| = 4$  and  $\mathbf{a}$  is parallel to  $\mathbf{b}$ .

Instructor: Rosanna Pearlstein

Math 251 – Spring 2023  
“Week-in-Review”

**Problem 11.** Are the vectors  $-8\mathbf{i} + 4\mathbf{j} + 12\mathbf{k}$  and  $6\mathbf{i} - 3\mathbf{j} - 9\mathbf{k}$  parallel, perpendicular, or neither?

**Problem 12.** The points  $A(0, -1, 6)$ ,  $B(2, 1, -3)$  and  $C(5, 4, 2)$  form a triangle. Find  $\angle C$ .

Instructor: Rosanna Pearlstein

Math 251 – Spring 2023  
“Week-in-Review”

**Problem 13.** Find the vector and scalar projection of  $\langle 1, 2, 5 \rangle$  onto  $\langle 0, 7, 4 \rangle$ .