

Math 241, Spring 2007, Merit Worksheet 1

1. List 3 things best described by using scalars and 3 things best described by using vectors.
2. A line segment starts at $(2, -7)$ and has midpoint $(5, -1)$. What is the other endpoint of the line segment?
3. A line segment starts at $(1, 3)$ and ends at $(4, 7)$. Where would it end if it were 5 times longer?
4. Draw a picture that shows how to find

$$\langle 1, 2 \rangle + 2 \langle 3, 1 \rangle - \langle 4, 5 \rangle .$$

5. Given the vectors $\mathbf{b} = \langle 1, 1 \rangle$ and $\mathbf{c} = \langle -1, 2 \rangle$, for the following vectors \mathbf{a} , find s and t such that $\mathbf{a} = s\mathbf{b} + t\mathbf{c}$.
 - (a) $\mathbf{a} = \langle 0, 6 \rangle$
 - (b) $\mathbf{a} = \langle -3, 6 \rangle$
 - (c) $\mathbf{a} = \langle 0, 0 \rangle$
 - (d) Choose your own vector \mathbf{a} .
 - (e) What does this tell you about any vector \mathbf{a} in \mathbb{R}^2 ?
6. If a, b and c are the vertices of a triangle, find $\vec{ab} + \vec{bc} + \vec{ca}$.
7. Let P be the point $(-2, 7, 3)$ and Q be the point $(2, 3, -4)$. Find the unit vector in the opposite direction to \vec{PQ} .
8. Figure 11.1.8 shows the vector a_{\perp} obtained by rotating the vector $\vec{a} = a_1\vec{i} + a_2\vec{j}$ through a counterclockwise angle of 90° . Show that
$$a_{\perp} = -a_2\vec{i} + a_1\vec{j}.$$
(Hint: Write \vec{a} as $(r \cos \theta)\vec{i} + (r \sin \theta)\vec{j}$.)
9. What is the distance between $(-1, 3, 7)$ and $(2, -1, 19)$?
10. What is $\|7\mathbf{i} + 9\mathbf{j} - 9\mathbf{k}\|$?
11. Describe the set of all points whose distance away from the z -axis is 4.
12. Which vectors are linear combinations of $\langle -4, 2 \rangle$ and $\langle 3, 1 \rangle$? Of $\langle -4, 2 \rangle$ and $\langle 2, -1 \rangle$? When are two vectors parallel?

Warm-Up problems for Tuesday

1. Find the angle between the vectors $\langle 0, 2 \rangle$ and $\langle \sqrt{3}, 3 \rangle$.
2. Find $\langle 2, -3, 1 \rangle \cdot \langle 0, 2, 7 \rangle$.