Math 2414 **Homework Set 9** **10 Points**

Vectors – The Basics

1. Explain the difference between $(-2,4)$ and $\langle -2,4\rangle$. Illustrate the difference with a sketch.

Vector Arithmetic

For problems 2 & 3 find $\|\vec{a}\|$, $12\vec{b}$ and $6\vec{a}-7\vec{b}$.

2. $\vec{a}=\langle 4,1\rangle \quad \vec{b}=\langle -8,-5\rangle$

3. $\vec{a}=5\vec{i}-7\vec{j} \quad \vec{b}=\vec{i}-9\vec{j}-4\vec{k}$

4. Find a unit vector that is in

(a) the same direction as $\vec{w}=\langle 5,2,-6\rangle$

(b) the opposite direction as $\vec{v}=\vec{i}+5\vec{j}-4\vec{k}$

Dot Product

For problems 5 & 6 compute $\vec{a}\bullet\vec{b}$.

5. $\vec{a}=\langle 2,9,-4\rangle, \quad \vec{b}=5\vec{i}-\vec{j}+7\vec{k}$

6. $\|\vec{a}\|=18, \ \|\vec{b}\|=5$ and the angle between $\vec{a}$ and $\vec{b}$ is $\theta=\dfrac{5\pi}{9}$.

For problems 7 & 8 find the angle between the two vectors and determine if the two vectors are parallel, orthogonal or neither.

7. $\vec{p}=\langle 0,8,-2\rangle, \quad \vec{q}=12\vec{i}-9\vec{j}+10\vec{k}$

8. $\vec{x}=\vec{i}+7\vec{j}-2\vec{k}, \ \vec{y}=\langle 8,-4,-10\rangle$

9. For $\vec{a}=\langle 2,9,-3\rangle, \quad \vec{b}=\langle 7,0,-6\rangle$ find the vector projection of $\vec{b}$ onto $\vec{a}$.

10. For $\vec{a}=\langle 2,9,-3\rangle, \quad \vec{b}=\langle 7,0,-6\rangle$ find the vector projection of $\vec{a}$ onto $\vec{b}$.

Cross Product

11. Find $\vec{v}\times\vec{w}$ and $\vec{w}\times\vec{v}$ for $\vec{v}=\langle 4,1,-8\rangle$ and $\vec{w}=3\vec{i}-2\vec{j}+7\vec{k}$

12. Find a vector that is orthogonal to the plane containing (3, -2, 2), (1, -7, 2) and (1, -1, 3).

13. Determine if $\langle 0,2,3\rangle$, $\langle -1,1,0\rangle$ and $\langle 8,3,-4\rangle$ all lie in the same plane.