

Homework: Vectors Math 150B.

1. Let $\vec{a} = -2\vec{j} + 3\vec{j}$, $\vec{b} = 2\vec{j} - 3\vec{j}$ and $\vec{c} = 5\vec{j}$. Compute the following:

- (a) $2\vec{a} - 4\vec{b}$;
- (b) $\vec{a} \cdot \vec{b}$;
- (c) $\vec{a} \cdot (\vec{b} + \vec{c})$;
- (d) $(2\vec{a} - 4\vec{b}) \cdot 5\vec{c}$;
- (e) $\vec{b} \cdot \vec{b} - \|\vec{b}\|$;

2. Find the cosine of the angle between the vectors \vec{a} and \vec{b} below.

- (a) $\vec{a} = \vec{j} - 3\vec{j}$ and $\vec{b} = 2\vec{j} - 3\vec{j}$
- (b) $\vec{a} = -2\vec{j} - 1\vec{j}$ and $\vec{b} = -2\vec{j} - 4\vec{j}$
- (c) $\vec{a} = -2\vec{j} - 1\vec{j}$ and $\vec{b} = 6\vec{j} + 0\vec{j}$
- (d) $\vec{a} = 4\vec{j} - 7\vec{j}$ and $\vec{b} = -8\vec{j} + 10\vec{j}$.

3. Find the vector components of the vector from the point $(1, 0)$ to the point $(6, 8)$.

4. A unit vector is a vector of magnitude 1 in any direction. So to find a unit vector in the direction of $\vec{a} = -4\vec{j} - 3\vec{j}$ just divide by its magnitude: $\sqrt{16 + 9} = \sqrt{25} = 5$. Thus

$$\frac{\vec{a}}{\|\vec{a}\|} = -\frac{4}{5}\vec{j} - \frac{3}{5}\vec{j}$$

is a unit vector in the direction of \vec{a} . Find unit vectors in the direction of the following:

- (a) $\vec{a} = -2\vec{j} + 3\vec{j}$
- (b) $\vec{b} = 2\vec{j} - 3\vec{j}$
- (c) $\vec{c} = 5\vec{j}$

5. Dot product fun.

- (a) Complete the following $(\vec{u} + \vec{v}) \cdot (\vec{u} - \vec{v}) = \|\vec{u}\|^2 + \dots$
- (b) If $(\vec{u} + \vec{v}) \cdot (\vec{u} - \vec{v}) = 0$ what can you say about the magnitude of \vec{u} and \vec{v} ?

6. For which numbers c are $\vec{a} = 2c\vec{j} - 8\vec{j}$ and $\vec{a} = 3\vec{j} + c\vec{j}$ perpendicular?

7. Show that the vector $\vec{a} = 5\vec{i} + 4\vec{j}$ is perpendicular to the line $5x + 4y = 3$.

8. Find the work done by the force $\vec{F} = 6\vec{i} + 8\vec{j}$ pound in moving an object from the point $(1, 0)$ to the point $(6, 8)$. Hint find the vector from $(1, 0)$ to the point $(6, 8)$ first.