

Name: _____

Physics 261 Worksheet #1: Vector Review

The topic is vectors. **Don't forget the back side!**

For the following chart, let $\vec{\mathbf{A}}$ and $\vec{\mathbf{B}}$ be vectors with components (in a particular Cartesian coordinate system!) given by (A_x, A_y, A_z) and (B_x, B_y, B_z) . If the *basis vectors* for that coordinate system are $\hat{\mathbf{i}}$, $\hat{\mathbf{j}}$, and $\hat{\mathbf{k}}$, then we can also write $\vec{\mathbf{A}} = A_x\hat{\mathbf{i}} + A_y\hat{\mathbf{j}} + A_z\hat{\mathbf{k}}$. Let α be the angle between $\vec{\mathbf{A}}$ and $\vec{\mathbf{B}}$. Let $c > 0$ and $c' < 0$ be scalar quantities. For the third column, use the specific values: $\vec{\mathbf{A}} = 3\hat{\mathbf{i}} - 2\hat{\mathbf{j}} + 4\hat{\mathbf{k}}$, $\vec{\mathbf{B}} = -\hat{\mathbf{i}} + 2\hat{\mathbf{j}} - 3\hat{\mathbf{k}}$, $c = 2$, and $c' = -1/2$.

	Geometric/Coordinate-Free	Coordinates	Specific
$\vec{\mathbf{A}}$			
$c\vec{\mathbf{A}}$			
$c'\vec{\mathbf{A}}$			
$\vec{\mathbf{A}} \perp \vec{\mathbf{B}}$			
$\vec{\mathbf{A}} = \vec{\mathbf{B}}$			
$\vec{\mathbf{A}} + \vec{\mathbf{B}}$			
$\vec{\mathbf{A}} - \vec{\mathbf{B}}$			
$\vec{\mathbf{A}} \cdot \vec{\mathbf{B}}$			
$\vec{\mathbf{A}} \times \vec{\mathbf{B}}$			
$ \vec{\mathbf{A}} $			
$\vec{\mathbf{A}} + \vec{\mathbf{B}} =$ $\vec{\mathbf{B}} + \vec{\mathbf{A}}$			

Basis Vectors

Evaluate the following:

1. $|\hat{\mathbf{j}}|$

2. $\hat{\mathbf{i}} \cdot \hat{\mathbf{i}}$

3. $\hat{\mathbf{i}} \cdot \hat{\mathbf{k}}$

4. $\hat{\mathbf{j}} \times \hat{\mathbf{i}}$

5. $\vec{\mathbf{A}} \cdot \hat{\mathbf{i}}$

Spot the Error

It's time for "Spot the Error!" Each of the equations below has an error or is incomplete. State the error and fix it, if possible. $\vec{\mathbf{A}}$, $\vec{\mathbf{B}}$, and $\vec{\mathbf{D}}$ are vectors and $c \neq 0$ is a scalar. The angle between the vectors is α .

1. $\vec{\mathbf{B}} = \vec{\mathbf{A}} + c$

2. $\vec{\mathbf{D}} = \vec{\mathbf{A}} \cdot \vec{\mathbf{B}}$

3. $\vec{\mathbf{A}} \cdot \vec{\mathbf{B}} = |\vec{\mathbf{A}}| |\vec{\mathbf{B}}| \sin \alpha$

4. $\vec{\mathbf{A}} \times \vec{\mathbf{B}} = |\vec{\mathbf{A}}| |\vec{\mathbf{B}}| \sin \alpha$

5. $\vec{\mathbf{A}} \times \vec{\mathbf{A}} = c$

6. $\vec{\mathbf{A}} \cdot (\vec{\mathbf{B}} \times \vec{\mathbf{A}}) = c$

7. $|\vec{\mathbf{D}}| = \vec{\mathbf{B}}$

8. $\vec{\mathbf{A}} \times \vec{\mathbf{D}} = \vec{\mathbf{D}} \times \vec{\mathbf{A}}$