Proof Of The Identity:

To prove the identity:

$$|ec{A} imesec{B}|^2+|ec{A}\cdotec{B}|^2=|ec{A}|^2|ec{B}|^2$$

we'll use properties of the dot product and cross product, along with trigonometric identities. Here's the step-by-step derivation:

Step 1: Define Terms

Let:

- \vec{A} and \vec{B} be two vectors.
- ullet heta be the angle between $ec{A}$ and $ec{B}$.

Step 2: Compute $|A\cdot B|^z$

The dot product $ec{A} \cdot ec{B}$ is given by:

$$ec{A}\cdotec{B}=|ec{A}||ec{B}|\cos heta$$

So, the square of the magnitude of the dot product is:

$$|ec{A}\cdotec{B}|^2=(|ec{A}||ec{B}|\cos heta)^2=|ec{A}|^2|ec{B}|^2\cos^2 heta$$

Step 3: Compute $|ec{A} imesec{B}|^2$

The cross product $\vec{A} imes \vec{B}$ has a magnitude given by:

$$|ec{A} imesec{B}|=|ec{A}||ec{B}|\sin heta$$

The square of the magnitude of the cross product is:

$$ertec{A} imesec{B}ert^2=(ertec{A}ertertec{B}ert\sin heta)^2=ertec{A}ert^2ertec{B}ert^2\sin^2 heta$$

Step 4: Add the Two Expressions

Now we add $| ec{A} imes ec{B} |^2$ and $| ec{A} \cdot ec{B} |^2$:

$$ertec{A} imesec{B}ert^2 + ertec{A}\cdotec{B}ert^2 = ertec{A}ert^2ertec{B}ert^2\sin^2 heta + ertec{A}ert^2ertec{B}ert^2\cos^2 heta$$

Step 5: Factor Out Common Terms

Factor out $|ec{A}|^2 |ec{B}|^2$ from the right-hand side:

$$= |ec{A}|^2 |ec{B}|^2 (\sin^2 heta + \cos^2 heta)$$

Step 6: Simplify Using the Pythagorean Identity

Since $\sin^2 \theta + \cos^2 \theta = 1$, we get:

$$|ec{A} imes ec{B}|^2 + |ec{A} \cdot ec{B}|^2 = |ec{A}|^2 |ec{B}|^2 \cdot 1 = |ec{A}|^2 |ec{B}|^2$$

Conclusion

This proves that:

$$|ec{A} imesec{B}|^2+|ec{A}\cdotec{B}|^2=|ec{A}|^2|ec{B}|^2$$

KNOWLEDGE MUST ONLY BE SHARED WITH THE ONE

WHO KNOWS ITS TRUE WORTH

NOT EVERYONE DESERVES IT - BILRED