

5. It is found that  $|A + B| = |A|$ . This necessarily implies,

- 1)  $B = 0$
- 2)  $A \cdot B \leq 0$
- 3) A, B are perpendicular
- 4) A, B are antiparallel

**Sol.** 1)  $B = 0$

We have to identify statements which are always true. It is given that  $|\vec{A} + \vec{B}| = |\vec{A}|$ , it could be true in two conditions that is either  $\vec{B} = 0$  or  $\vec{B} = -2\vec{A}$ .

For forming a single condition we will multiply them, as either one of them is true it will uphold the necessary condition

We know  $\vec{B} = 0$ ,  $\vec{B} - 2\vec{A} = 0$  (from previous equations)

Therefore their magnitude's product will also be zero.

$$|\vec{B}|(|\vec{B}| - 2|\vec{A}|) = 0 \text{ (This will always be true)}$$

$$|\vec{B}|^2 - 2|\vec{A}||\vec{B}| = 0$$

Therefore,

$$|\vec{A}||\vec{B}| \leq 0 \text{ (Equality is true for } B = 0)$$

Above condition is always true