



**SOLUTION**1. **Ans. (4)**2. **Ans. (3)**

$$|\vec{A} + \vec{B}| = 2a \cos \theta / 2 \quad \text{---(1)}$$

$$|\vec{A} - \vec{B}| = 2a \cos \frac{(\pi - \theta)}{2} = 2a \sin \theta / 2 \quad \text{---(2)}$$

$$\Rightarrow n \left( 2a \cos \frac{\theta}{2} \right) = 2a \frac{\sin \theta}{2}$$

$$\Rightarrow \tan \frac{\theta}{2} = n$$

3. **Ans. (2)**

$$\vec{r}_g = \frac{a}{2} \hat{i} + \frac{a}{2} \hat{k}$$

$$\vec{r}_H = \frac{a}{2} \hat{j} + \frac{a}{2} \hat{k}$$

$$\vec{r}_H - \vec{r}_g = \frac{a}{2} (\hat{j} - \hat{i})$$

4. **Ans. (3)**

$$\text{Sol. } |\vec{A}_1| = 3 \quad |\vec{A}_2| = 5 \quad |\vec{A}_1 + \vec{A}_2| = 5$$

$$|\vec{A}_1 + \vec{A}_2| = \sqrt{|\vec{A}_1|^2 + |\vec{A}_2|^2 + 2|\vec{A}_1||\vec{A}_2|\cos \theta}$$

$$5 = \sqrt{9 + 25 + 2 \times 3 \times 5 \cos \theta}$$

$$\cos \theta = -\frac{9}{2 \times 3 \times 5} = -\frac{3}{10}$$

$$(2\vec{A}_1 + 3\vec{A}_2) \cdot (3\vec{A}_1 - 2\vec{A}_2)$$

$$= 6|\vec{A}_1|^2 + 9\vec{A}_1 \cdot \vec{A}_2 - 4\vec{A}_1 \vec{A}_2 - 6|\vec{A}_2|^2$$

$$= 54 + 5 \times 3 \times 5 \left( -\frac{3}{10} \right) - 6 \times 25$$

$$= 54 - 150 - \frac{45}{2} = -118.5$$