4. Let $\left|\overrightarrow{A_1}\right| = 3$, $\left|\overrightarrow{A_2}\right| = 5$ and $\left|\overrightarrow{A_1} + \overrightarrow{A_2}\right| = 5$. The value of $\left(2\overrightarrow{A_1} + 3\overrightarrow{A_2}\right) \bullet \left(3\overrightarrow{A_1} - 2\overrightarrow{A_2}\right)$ is: [Main 8 April 2019 (II)]

(a) -106.5 (b) -99.5

(c) -112.5 (d) -118.5

ans (d) Using,

$$R^2 = A_1^2 + A_2^2 + 2A_1A_2\cos\theta$$

$$5^2 = 3^2 + 5^2 + 2 \times 3 \times 5\cos\theta$$

or $\cos\theta = -0.3$

$$\left(2\vec{A}_1 + 3\vec{A}_2\right) \cdot \left(3\vec{A}_1 - 2\vec{A}_2\right) = 2A_1 \times 3A_1$$

$$+ (3A_2)(3A_1)\cos\theta - (2A_1)(2A_2)\cos\theta - 3A_2 \times 2A_2$$

$$= 6A_1^2 + 9A_1A_2\cos\theta - 4A_1A_2\cos\theta - 6A_2^2$$

$$= 6A_1^2\ 6A_2^2 + 5A^{-}{}_1A_2\cos\theta$$

$$= 6 \times 3^2 - 6 \times 5^2 + 5 \times 3 \times 5(-0.3) = -118.5$$