10. Condition: given two vectors: $\vec{a} = 4\vec{i} - 3\vec{j} + 2\vec{k}; \vec{b} = \vec{i} + 2\vec{j} - \vec{k}$. Calculate $\vec{a} \times \vec{b}$.

Solution: by definition, $\vec{a} \times \vec{b}$ is $\begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ a_x & a_y & a_z \\ b_x & b_y & b_z \end{vmatrix} = \{a_y b_z - a_z b_y; a_z b_x - a_x b_z; a_x b_y - a_y b_y\} = \{3 - 4; 2 + 6; 8 + 3\} = \{-1; 6; 11\} = -\vec{i} + 6\vec{j} + 11\vec{k}$.

Answer: $-\vec{i} + 6\vec{j} + 11\vec{k}$.

11. Condition: given three vectors: $\vec{a} = \vec{i} - 2\vec{j} + 3\vec{k}; \vec{b} = 2\vec{i} + \vec{j} - \vec{k}; \vec{c} = 3\vec{i} - 2\vec{j} + 3\vec{k}$. Calculate $\vec{a} \cdot (\vec{b} \times \vec{c})$.

Solution: calculating vector product: $(\vec{b} \times \vec{c}) = (3 - 2; -3 - 6; -4 - 3) = (1; -9; -7)$.

Calculating dot product: $(1; -2; 3) \cdot (1; -9; -7) = 1 + 18 - 21 = -2$.

Answer: -2.