

Verify 1-30 Grind it out

$$\vec{A} \times (\vec{B} \times \vec{C}) = \vec{A} \times \begin{vmatrix} \hat{x} & \hat{y} & \hat{z} \\ B_x & B_y & B_z \\ C_x & C_y & C_z \end{vmatrix}$$

$$= \vec{A} \times (\hat{x}(B_y C_z - B_z C_y) + \hat{y}(C_x B_z - C_z B_x) + \hat{z}(B_x C_y - B_y C_x))$$

$$= \begin{vmatrix} \hat{x} & \hat{y} & \hat{z} \\ A_x & A_y & A_z \\ B_y C_z - B_z C_y & C_x B_z - C_z B_x & B_x C_y - B_y C_x \end{vmatrix}$$

$$= \hat{x} [A_y B_x C_y - A_z B_z C_x - A_y B_y C_x + A_z B_z C_z]$$

$$+ \hat{y} [A_x B_x C_y - A_x B_y C_x - A_z B_y C_z + A_z B_z C_y]$$

$$+ \hat{z} [A_x B_z C_x - A_x B_x C_z - A_y B_y C_z + A_y B_z C_y]$$

$$\vec{B}(\vec{A} \cdot \vec{C}) - \vec{C}(\vec{A} \cdot \vec{B}) = B_x \hat{x} (A_x C_x + A_y C_y + A_z C_z)$$

$$+ B_y \hat{y} [A_x C_x + A_y C_y + A_z C_z] + B_z \hat{z} [A_x C_x + A_y C_y + A_z C_z]$$

$$- C_x \hat{x} [A_x B_x + A_y B_y + A_z B_z] - C_y \hat{y} [A_x B_x + A_y B_y + A_z B_z]$$

$$- C_z \hat{z} [A_x B_x + A_y B_y + A_z B_z] \quad \text{gather } \hat{x}, \hat{y}, \hat{z} \text{ terms}$$

$$= \hat{x} [A_x B_x C_x + A_y B_x C_y + A_z B_x C_z - A_x B_x C_x - A_y B_y C_x - A_z B_z C_x]$$

$$+ \hat{y} [A_x B_y C_x + A_y B_y C_y + A_z B_y C_z - A_x C_y B_x - A_y B_y C_y - A_z B_z C_y]$$

$$+ \hat{z} [A_x B_z C_x + A_y B_z C_y + A_z B_z C_z - A_x B_x C_z - A_y B_y C_z - A_z B_z C_z]$$

Comparison shows remaining terms are equal!!