

1.

$$\mathbf{r}_1 \times \mathbf{r}_2 = \begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ x_1 & y_1 & z_1 \\ x_2 & y_2 & z_2 \end{vmatrix} = \langle y_1 z_2 - z_1 y_2, z_1 x_2 - x_1 z_2, x_1 y_2 - y_1 x_2 \rangle$$

$$\rightarrow \frac{d(\mathbf{r}_1 \times \mathbf{r}_2)}{dt} = \mathbf{r}_1' \times \mathbf{r}_2 + \mathbf{r}_1 \times \mathbf{r}_2'$$