# ROTATE-VECTORS FUNCTION

cross product: $a \times b = \|a\| \|b\| \sin \alpha$

$$e = (v_1 \times v_2)^T (v_1 \times v_2) \sim (\|a\| \|b\|)^2 \sin^2 \alpha$$

$$\dot{e} = 2 (v_1 \times v_2)^T (v_1 \times \dot{v}_2 - v_2 \times \dot{v}_1)$$

$$\dot{e} = \underbrace{2 (\hat{S}_{v_1} \cdot v_2)^T (\hat{S}_{v_1} J_{v_2} - \hat{S}_{v_2} J_{v_1})}_{J_T} \dot{q}$$

$$\dot{J}_T = 2 [\dot{v}_1 \times v_2 + v_1 \times \dot{v}_2] (\hat{S}_{v_1} J_{v_2} - \hat{S}_{v_2} J_{v_1}) +$$
$$+ 2 (\hat{S}_{v_1} \cdot v_2)^T [\dot{\hat{S}}_{v_1} J_{v_2} + \hat{S}_{v_1} \dot{J}_{v_2} - \dot{\hat{S}}_{v_2} J_{v_1} - \hat{S}_{v_2} \dot{J}_{v_1}]$$