$$\vec{y} = \vec{R} + \vec{y}'$$

$$\boxed{\begin{aligned} \dot{\hat{e}}'_i &= M_i{}^j \hat{e}'_j = (\vec{\omega} \times \hat{e})_i \\ \ddot{\hat{e}}'_i &= \dot{M}_i{}^j \hat{e}'_j + M_i{}^k M_k{}^j \hat{e}'_j \end{aligned}}$$

$$y^i \hat{e}_i = R^i \hat{e}_i + y'^i \hat{e}'_i$$

$$\dot{y}^i \hat{e}_i = \dot{R}^i \hat{e}_i + \dot{y}'^i \hat{e}'_i + y'^i \dot{\hat{e}}'_i$$

$$\ddot{y}^i \hat{e}_i = \ddot{R}^i \hat{e}_i + \ddot{y}'^i \hat{e}'_i + 2\dot{y}'^i \dot{\hat{e}}'_i + y'^i \ddot{\hat{e}}'_i$$

$$\ddot{y}^i \hat{e}_i = \ddot{R}^i \hat{e}_i + \ddot{y}'^i \hat{e}'_i + 2\dot{y}'^i M_i{}^j \hat{e}'_j + y'^i M_i{}^k M_k{}^j \hat{e}'_j + y'^i \dot{M}_i{}^j \hat{e}'_j$$

$$\vec{a} = \ddot{\vec{R}} + \vec{a}' + 2\vec{\omega} \times \vec{v}' + \vec{\omega} \times (\vec{\omega} \times \vec{r}') + \dot{\vec{\omega}} \times \vec{r}'$$

$$\boxed{\vec{a}' = \vec{a} - \ddot{\vec{R}} - 2\vec{\omega} \times \vec{v}' - \vec{\omega} \times (\vec{\omega} \times \vec{r}') - \dot{\vec{\omega}} \times \vec{r}'}$$

$\hat{i} \quad \hat{j} \quad \hat{k}$ $\quad [\omega y]$