1. $\boldsymbol{r}$**:** $\boldsymbol{r}(t)$, $(x,y,z)(t)$, $\boldsymbol{r}(s)$.
   $\dot{\boldsymbol{r}}$**:** $\dot{\boldsymbol{r}}(t)$, $(\dot x,\dot y,\dot z)(t)$, $\boldsymbol{\tau}\dot s$.
   $\ddot{\boldsymbol{r}}$**:** $\ddot{\boldsymbol{r}}(t)$, $(\ddot x,\ddot y,\ddot z)(t)$, $\ddot s\boldsymbol{\tau} + \dot s^2 k_1 \boldsymbol{n}$
2. $\langle ? \rangle$
3. В криволинейных координатах

▷ $\boldsymbol{v} = \sum\limits_k \dot q^k \boldsymbol{e_k}$

▷ $\boldsymbol{w} = \sum\limits_k \ddot q^k \boldsymbol{e_k} + \sum\limits_{k,i} \dot q^k \dot q^i \dfrac{\partial \boldsymbol{e_k}}{\partial q^i}$

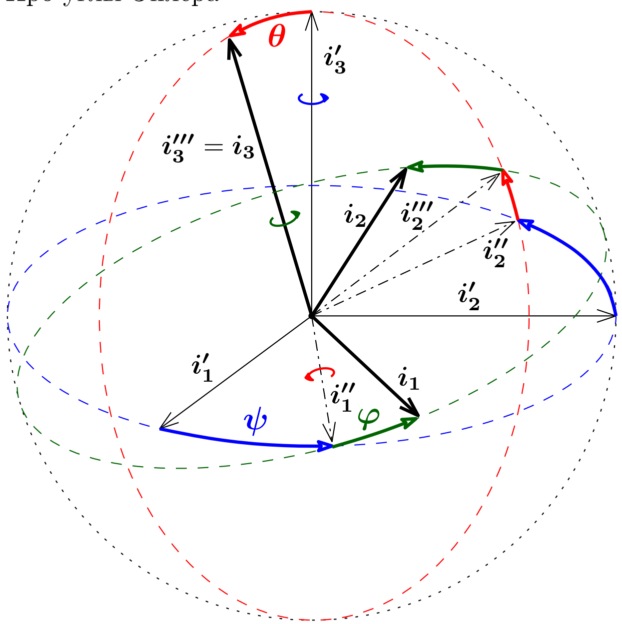
▷ $w^j = \ddot q^j + \sum\limits_{k,i} \dot q^k \dot q^i\, \Gamma^j_{ki}$

▷ $\Gamma_{j,\,ki} = \dfrac{\partial \boldsymbol{e_k}}{\partial q^i} \cdot \boldsymbol{e_j}$ — I рода

▷ $\Gamma^j_{ki} \;= \dfrac{\partial \boldsymbol{e_k}}{\partial q^i} \cdot \boldsymbol{e^j}$ — II рода

▷ $w_\ell = \dfrac{\mathrm{d}}{\mathrm{d}t}\left(\dfrac{\partial}{\partial \dot q^\ell}\left(\dfrac{\dot{\boldsymbol{r}}^2}{2}\right)\right) - \dfrac{\mathrm{d}}{\mathrm{d}q^\ell}\left(\dfrac{\dot{\boldsymbol{r}}^2}{2}\right)$

4. Про углы Эйлера



▷ $\boldsymbol{\omega} = \dot\psi\, \boldsymbol{i'_3} + \dot\theta\, \boldsymbol{i''_1} + \dot\varphi\, \boldsymbol{i_3}$

▷ $\boldsymbol{R}(t) = \boldsymbol{R_0}(t) + \boldsymbol{r}(t)$
▷ $\boldsymbol{v} = \boldsymbol{v_0} + \boldsymbol{\omega} \times \boldsymbol{r} + \boldsymbol{v_r}$
▷ $\boldsymbol{w} = \boldsymbol{w}_0 + \dot{\boldsymbol{\omega}} \times \boldsymbol{r} + \boldsymbol{\omega} \times (\boldsymbol{\omega} \times \boldsymbol{r}) + 2\boldsymbol{\omega} \times \boldsymbol{v_r} + \boldsymbol{w_r}$

5.

6.

7.

8.

9. В поле центральной силы ¬

▷ $u = 1/\rho$.
▷ Формулы Бине
$$\begin{cases} v^2 = c^2\left(\left(\dfrac{\mathrm{d}u}{\mathrm{d}\varphi}\right)^2 + u^2\right) \\ w_\rho = -c^2u^2\left(\dfrac{\mathrm{d}^2u}{\mathrm{d}\varphi^2} + u\right) \end{cases}$$
▷ Невыразимая жжесть

10. $\langle ? \rangle$⟨`:set aflame`⟩Движение твёрдого тела ¬

▷ $\omega = 0$ — поступательное
▷ $\boldsymbol{v_0}, \boldsymbol{w_0} = 0, \omega = \dot\varphi \boldsymbol{i_3}$ — вращение вокруг неподвижной оси
▷ $\boldsymbol{v_0} \upuparrows \boldsymbol{\omega}$ — винт
▷ $\langle ? \rangle$Как попало вокруг неподвижной точки [1] ¬
$$\begin{aligned} \boldsymbol{\omega} = {} & \boldsymbol{i_1}(\dot\psi \sin\theta \sin\varphi + \dot\theta\cos\varphi) + \\ & + \boldsymbol{i_2}(\dot\psi \sin\theta\cos\varphi - \dot\theta\sin\varphi) + \\ & + \boldsymbol{i_3}(\dot\psi\cos\varphi + \dot\varphi) \end{aligned}$$

11. Скорость и ускорение точек твердого тела

▷ $\boldsymbol{v} = \boldsymbol{v_0} + \boldsymbol{\omega} \times \boldsymbol{r}$
▷ $\boldsymbol{w} = \boldsymbol{w_0} + \dot{\boldsymbol{\omega}} \times \boldsymbol{r} + \boldsymbol{\omega} \times (\boldsymbol{\omega} \times \boldsymbol{r})$

12. Сложение движений ТТ

▷ $\boldsymbol{v_{r_n}} = \sum\limits_{k=0}^{n-1}\left(\boldsymbol{v_k} + \boldsymbol{\omega_k} \times \overrightarrow{O_kO}\right) + \sum\limits_{k=0}^{n-1} \boldsymbol{\omega_k} \times \boldsymbol{r_0}$, $O_0 = O$.

▷ $\boldsymbol{V} = \sum\limits_{k=0}^{n-1}\left(\boldsymbol{v_k} + \boldsymbol{\omega_k} \times \overrightarrow{O_kO}\right)$

▷ $\Omega = \sum\limits_{k=0}^{n-1} \boldsymbol{\omega_k} \quad \Rightarrow \boldsymbol{v_{r_n}} = \boldsymbol{V} + \boldsymbol{\Omega} \times \boldsymbol{r_0}$

13. Кинематический винт

▷ $\boldsymbol{\omega} \times \boldsymbol{v}_0 + \boldsymbol{\omega} \times (\boldsymbol{\omega} \times \boldsymbol{r}) = 0$

14. Плоское движение

▷ $0 = \boldsymbol{v}_0 + \boldsymbol{\omega} \times \boldsymbol{r}_c$
▷ $\boldsymbol{r}_* = \left(-\dfrac{v_{0y}}{\omega}, +\dfrac{v_{0x}}{\omega}\right)$ —подвижная центроида
▷ $\boldsymbol{r}'_* = \boldsymbol{r}_* + \boldsymbol{r}_0$ — неподвижная центроида
▷ $\omega = \dfrac{|\boldsymbol{v}_B - \boldsymbol{v}_A|}{|\boldsymbol{r}_B - \boldsymbol{r}_A|}$
▷ $\omega = \dfrac{|\boldsymbol{v}_a \times \boldsymbol{r}_{A*}|}{r^2_{A*}}$ и то же с B.
▷ центр ускорений: $\langle ? \rangle$

15. Динамика вращения ТТ [2]

▷ $M = \displaystyle\int_\tau 1\,\mathrm{d}\mu(r)$, $\boldsymbol{r}_c = \dfrac{\displaystyle\int_\tau \boldsymbol{r}\,\mathrm{d}\mu(r)}{\displaystyle\int_\tau 1\,\mathrm{d}\mu(r)}$

▷ $\boldsymbol{\ell} = \displaystyle\int_\tau (\boldsymbol{r} \times (\boldsymbol{\omega} \times \boldsymbol{r})\,\mathrm{d}\mu$, $\boldsymbol{\ell}' = \displaystyle\int_\tau (\boldsymbol{R} \times \boldsymbol{v})\,\mathrm{d}\mu$
▷ $\boldsymbol{\ell}' = \boldsymbol{R}_0 \times \boldsymbol{v}_0\, M + \boldsymbol{r}_c \times \boldsymbol{v}_0\, M + \boldsymbol{R}_0 \times (\boldsymbol{\omega} \times \boldsymbol{r}_c)M + \ell$
▷ $T = \dfrac{1}{2}\displaystyle\int_\tau (\boldsymbol{\omega} \times \boldsymbol{r})^2\,\mathrm{d}\mu$, $T' = \dfrac{1}{2}\displaystyle\int_\tau \boldsymbol{v}^2\,\mathrm{d}\mu$
▷ $T' = T + \dfrac{1}{2}M\boldsymbol{v}_0^2 + M\boldsymbol{v}_0 \cdot (\boldsymbol{\omega} \times \boldsymbol{r}_c)$
▷ $\ell_\omega = \omega J_\omega$
▷ $\boldsymbol{\ell} = \widehat{J}\boldsymbol{\omega} = \sum\limits_{j,k} J_{jk}\omega_k\, \boldsymbol{i}_j$, $J_{ik} = \displaystyle\int_\tau (r^2\delta_{jk} - x_jx_k)\,\mathrm{d}\mu$

▷ $T = \dfrac{J_\omega \omega^2}{2} = \dfrac{\widehat{J}\,\boldsymbol{\omega}\cdot\boldsymbol{\omega}}{2}$

[1] У нас тут вроде косяк, а дальше снова как здесь $\langle \ddot\smile \rangle$
[2] Здесь по-хорошему надо меру на многобразии вводить