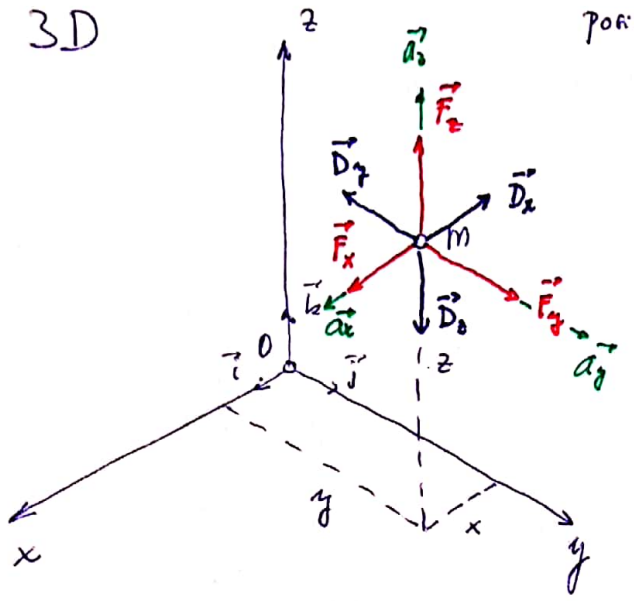
CARTESIAN COORDINATE SYSTEM

3D



position (x, y, z)

velocity: $\dot{x} = v_x = \frac{dx}{dt}$

$\dot{y} = v_y = \frac{dy}{dt}$

$\dot{z} = v_z = \frac{dz}{dt}$

acceleration

$\ddot{x} = a_x = \dot{v}_x = \frac{dv_x}{dt} = \frac{d^2x}{dt^2}$

$\ddot{y} = a_y = \frac{d^2y}{dt^2}$

$\ddot{z} = a_z = \frac{d^2z}{dt^2}$

acting force $\vec{F}(F_x, F_y, F_z)$

d'Alembert's force $\vec{D} = -m\vec{a}$; $\vec{D}(D_x, D_y, D_z)$

generally:

$\sum_{(i)} \vec{F}_i + \vec{D} = \vec{0}$ vector eqn. of dynamic equilibrium

component equations:

(1) x: $\sum_{(i)} F_{ix} - D_x = 0$

(2) y: $\sum F_{iy} - D_y = 0$

(3) z: $\sum F_{iz} - D_z = 0$

force specification:

$D_x = m a_x$

$D_y = m a_y$

$D_z = m a_z$