## Dynamics of mass point

1. Body with mass $m=3 \mathrm{~kg}$ moves on a substrate and its position at any time can be determined using the position vector $\vec{r}=5 t^{3} \vec{i}+\left(3 t^{2}-2\right) \vec{j}-4 t \vec{k}$. Determine the momentum and force of body in time $t=5 \mathrm{~s}$. Neglect pad friction and air resistance.
2. Car with a weight of 1 tone is in the rest. A constant force of $1,5 k N$ starts to act on him (the car starts to move due to the force). Neglect resistance and friction forces. Calculate:
a.) acceleration of the car,
b.) the speed of the car in the time 5 minutes from the beginning of the action of force,
c.) the distance the car travels in half an hour from the start of the movement (application of force).
3. A projectile with a mass of 10 kg flying along the railway line at a speed of $500 \mathrm{~m} . \mathrm{s}^{-1}$ crashed into a wagon with sand with a mass of $5 t$ and got stuck in it. Calculate at what speed and in which direction the wagon will move after the impact, if before the collision it had a speed of $25 \mathrm{~km} \cdot \mathrm{~h}^{-1}$ and was moving
a) in the direction of the projectile,
b) opposite the projectile.
4. Projectile with a mass of 20 g hits a tree at a speed of $400 \mathrm{~m} \cdot \mathrm{~s}^{-1}$. Calculate how deep the projectile penetrates the tree if the average wood resistance is 10 kN .
