A force of $2\vec{\imath} + 7\vec{\jmath}\,N$acts on a body of mass 5 kg for 10 seconds. The body was initially moving with constant velocity of $\vec{\imath} - 2\vec{\jmath}\,\frac{m}{s}$. Find the final velocity of the body in $\frac{m}{s}$, in vector form.

Solution.

According to Newton's second law:

$$\vec{a} = \frac{\vec{F}}{m} = \frac{2\vec{\imath} + 7\vec{\jmath}}{5} = 0{,}4\vec{\imath} + 1{,}4\vec{\jmath}\ \frac{m}{s^2}\ ,$$

where $\vec{F}$ is the force acting on the body, m is the mass of the body and $\vec{a}$ is the acceleration of the body.

We have the uniformly accelerated motion because the acceleration $\vec{a}$ don't depend on time. Then the velocity of the body is:

$$\vec{v} = \overrightarrow{v_0} + \vec{a}t = \vec{\imath} - 2\vec{\jmath} + (0{,}4\vec{\imath} + 1{,}4\vec{\jmath}) \cdot 10 = 5\vec{\imath} + 12\vec{\jmath}\ \frac{m}{s}\ ,$$

where $\overrightarrow{v_0}$ is the initial velocity and t is the time of the acting of the force.

Answer: $5\vec{\imath} + 12\vec{\jmath}\ \frac{m}{s}$.