

Answer on Question #40357, Physics, Mechanics | Kinematics | Dynamics

Question:

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

Answer:

Newton's second law of motion can be expressed in equation form as follows:

$$\sum \vec{F} = m\vec{a}$$

where m is mass of the body, F is force, a is acceleration.

Therefore:

$$\vec{a} = \frac{\vec{F}}{m}$$

Velocity equals:

$$\vec{v} = \vec{v}_0 + \vec{a}t = \vec{i} - 2\vec{j} + \frac{2\vec{i} + 7\vec{j}}{5} 10 = \vec{i}(1 + 4) + \vec{j}(-2 + 14) = 5\vec{i} + 12\vec{j}$$

Answer: $5\vec{i} + 12\vec{j}$