Answer on Question #61860-Physics-Mechanics

A particle of mass 1 kg moving with initial velocity (i^+2k^) m/s is acted upon by a constant force (i^+2j^−2k^) N. Calculate the velocity and distance after 5s.

Solution

$$\boldsymbol{a} = \frac{\boldsymbol{F}}{m} = \frac{(1,2,-2)}{1} = (1,2,-2)\frac{m}{s^2}.$$

The velocity is

$$\boldsymbol{v} = \boldsymbol{v_i} + \boldsymbol{a}t = (1,0,2) + 5(1,2,-2) = (6,10,-8)\frac{m}{s} = (6\boldsymbol{i} + 10\boldsymbol{j} - 8\boldsymbol{k})\frac{m}{s}$$

The displacement is

$$\boldsymbol{s} = \boldsymbol{v_i}t + \frac{\boldsymbol{a}t^2}{2} = (1,0,2)5 + \frac{5^2}{2}(1,2,-2) = (6,10,-8)m = (17.5\boldsymbol{i} + 25\boldsymbol{j} - 15\boldsymbol{k})m$$

The distance is

$$s = \sqrt{(17.5)^2 + (25)^2 + (-15)^2} = 34\ m.$$