12 In this question the unit vectors **i** and **j** are horizontal and vertically upwards respectively.

A particle has mass 2 kg.

(a) Write down its weight as a vector. [1]

A horizontal force of 3 N in the **i** direction and a force $\mathbf{F} = (-4\mathbf{i} + 12\mathbf{j})$ N act on the particle.

(b) Determine the acceleration of the particle. [3]

(c) The initial velocity of the particle is $5\mathbf{i}\,\mathrm{m\,s^{-1}}$.

Find the velocity of the particle after 4 s. [2]

(d) Find the extra force that must be applied to the particle for it to move at constant velocity. [1]