A particle starts from a point O and moves in a straight line. The velocity $v\,\mathrm{m\,s^{-1}}$ of the particle at time t s after leaving O is given by

$$v = k(3t^2 - 2t^3),$$

where k is a constant.

(a) Verify that the particle returns to O when $t = 2$. [4]

(b) It is given that the acceleration of the particle is $-13.5\,\mathrm{m\,s^{-2}}$ for the positive value of t at which $v = 0$.

Find k and hence find the total distance travelled in the first two seconds of motion. [6]