

A particle starts from a point O and moves in a straight line. The velocity $v \text{ ms}^{-1}$ of the particle at time $t \text{ s}$ 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]

This image shows a full page of primary-ruled paper. It features approximately 20 horizontal dotted lines spaced evenly down the page, providing a guide for handwriting practice. The background is white, and there are no margins or other markings present.

- (b)** It is given that the acceleration of the particle is -13.5 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]

This image shows a full page of white paper with horizontal dashed lines, typical of primary school writing paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.