

3.1 (*Edexcel IAL WME02 June 2025 Q1.*) A particle P moves along the x-axis. At time $t = 0$, P is at rest at the origin O. At time t seconds the acceleration of P in the positive x direction is $k(3 - t^2)$ m s^{-2} , where k is a positive constant. Given that when $t = 1.5$ the speed of P is 13.5 m s^{-1} , (a) show that $k = 4$, (b) show that $s = \frac{1}{3}t^2(18 - t^2)$, (c) find the total distance travelled by P before it returns to O. [9]

3.2 (*EDEXCEL IAL WME02 June 2025 Q2.*) A particle P of mass 3 kg moves on a smooth horizontal plane. Relative to a fixed origin, $\mathbf{r} = 4t^{\frac{1}{2}}\mathbf{i} - 3t\mathbf{j}$ metres for $1 \leq t \leq 4$. At the instant $t = 4$, P receives an impulse $(6\mathbf{i} - 3\mathbf{j})$ N s. Find the speed of P immediately after the impulse. [7]
