



QUESTION WORKBOOK

# Further kinematics: acceleration as a function of $x$ , $t$ or $v$

Further Mechanics 2 · Year FM

6 questions · 22 marks

PRINT EDITION

**SECTION A** · Warm-up

- A1** State which form of the acceleration you would use if it depends on the displacement, and why the other form fails. [2]

---

---

- A2** A particle has acceleration  $(6t - 2) \text{ m/s}^2$  and speed  $1 \text{ m/s}$  at  $t = 0$ . Find its speed at  $t = 3$ . [3]

**SECTION B** · Standard

- B1** A particle moving at  $20 \text{ m/s}$  decelerates at  $0.02v^2 \text{ m/s}^2$ . Find its speed after it has travelled  $50 \text{ m}$ . [4]

- B2** A particle moving at  $15 \text{ m/s}$  decelerates at  $0.4v \text{ m/s}^2$ . Find how long it takes for the speed to halve. [4]

- B3** A body has acceleration  $(2 - 0.05v^2) \text{ m/s}^2$ . Find its terminal speed. [3]

### SECTION C · Stretch

- C1** A particle  $P$  moves along a straight line through a fixed point  $O$ . When  $P$  is  $x$  metres from  $O$  its acceleration is  $6/x^2 \text{ m/s}^2$  directed towards  $O$ . At  $x = 2$  the particle is moving away from  $O$  with speed  $2 \text{ m/s}$ . Find the speed of  $P$  when  $x = 4$ , and the greatest distance of  $P$  from  $O$ . [6]