

## Summary of key points

**1 Simple harmonic motion** (S.H.M.) is motion in which the acceleration of a particle  $P$  is always towards a fixed point  $O$  on the line of motion of  $P$ . The acceleration is proportional to the displacement of  $P$  from  $O$ .

**2**  $\ddot{x} = v \frac{dv}{dx}$

**3** For a particle moving with **damped harmonic motion**

$$\frac{d^2x}{dt^2} + k \frac{dx}{dt} + \omega^2 x = 0$$

where  $x$  is the displacement from a fixed point at time  $t$ , and  $k$  and  $\omega^2$  are positive constants.

**4** For a particle moving with **forced harmonic motion**

$$\frac{d^2x}{dt^2} + k \frac{dx}{dt} + \omega^2 x = f(t)$$

where  $x$  is the displacement from a fixed point at time  $t$ , and  $k$  and  $\omega^2$  are positive constants.

**5** You can solve coupled first-order linear differential equations by eliminating one of the dependent variables to form a second-order differential equation.