5.18 Second order differential equations

Checklist

What you should know

By the end of this subtopic you should be able to:

- understand second-order differential equation models in context
- find approximate solutions to second-order differential equations of the form $\frac{\mathrm{d}^2x}{\mathrm{d}t^2} = f(x, \frac{\mathrm{d}x}{\mathrm{d}t}, t)$
  - convert second-order differential equations into a coupled system of first-order differential equations $\frac{\mathrm{d}x}{\mathrm{d}t} = y$ and $\frac{\mathrm{d}y}{\mathrm{d}t} = f(x, y, t)$.
  - use Euler's method to find approximate solutions.
- use phase portrait method to investigate solutions when the equation has the special form $\frac{\mathrm{d}^2x}{\mathrm{d}t^2} + a\frac{\mathrm{d}x}{\mathrm{d}t} + bx = 0$.