5.9 Further differentiation

Checklist

What you should know

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

- find derivatives of:
  - $f(x) = \sin x$
  - $f(x) = \cos x$
  - $f(x) = \tan x$
  - $f(x) = e^x$
  - $f(x) = \ln x$
- find derivatives of complex functions using the:
  - power rule $f(x) = x^n \Rightarrow f'(x) = nx^{n-1}$
  - chain rule $y = g(u)$, where $u = f(x) \Rightarrow \frac{\mathrm{d}y}{\mathrm{d}x} = \frac{\mathrm{d}y}{\mathrm{d}u} \times \frac{\mathrm{d}u}{\mathrm{d}x}$
  - product rule $y = uv \times \frac{\mathrm{d}y}{\mathrm{d}x} = u\frac{\mathrm{d}v}{\mathrm{d}x} + v\frac{\mathrm{d}u}{\mathrm{d}x}$
  - quotient rule $y = \frac{u}{v} \Rightarrow \frac{\mathrm{d}y}{\mathrm{d}x} = \frac{v\frac{\mathrm{d}u}{\mathrm{d}x} - u\frac{\mathrm{d}v}{\mathrm{d}x}}{v^2}$
- solve related rates of change using the steps:
  - understand the problem
  - develop a model
  - write an equation relating what you want and what you have been given
  - differentiate both sides with respect to time
  - substitute any known values
  - answer the question.