Y12 Advanced Topic 1: Differential Calculus
Lesson 1: Introduction to Differentiation

**Learning intentions:**

Students will:

- Revise the foundations of Indices, including index laws involving negative indices
- Revise fractional indices.

*Textbook Reference: Y11 Canbridge Advanced Ex. 7A, 7B*

# 1 Warm-Up

**1.** The inverse operation to **differentiation** is _____

**2.** For each of the following equations, find $\frac{dy}{dx}$

**(a)** $y = x^2$

**(b)** $y = \sin x$

**3.** Differentiate the following:

**(a)** $y = \cos(x)$

**(b)** $f(x) = \tan x$

**(c)** $g = \frac{1}{x^2}$

**(d)** $y = e^{\sin x}$

# 2 Differentiation Rules

To differentiate a combination of functions, we have a number of rules.

## 2.1 Product Rule

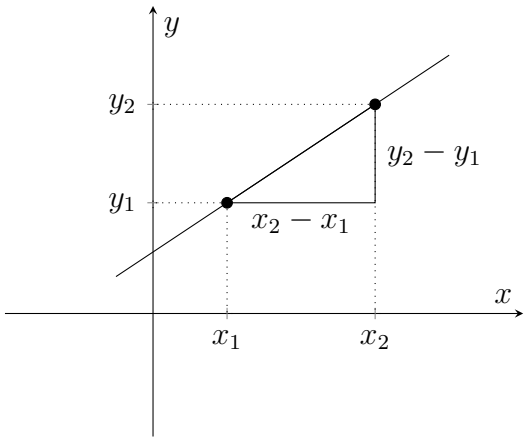
To differentiate the product of functions $y = u(x) \times v(x)$, use the product rule:

$$y = u'v + uv'$$

**Ex. 1** — Differentiate $y = x \sin x$

# 3 Gradients

To calculate a gradient:




**Gradient Formula**

To find the gradient:

$$\begin{aligned} \text{Gradient} &= \frac{\text{rise}}{\text{run}} \\ &= \frac{y_2 - y_1}{x_2 - x_1} \end{aligned}$$

**Ex. 2** — Find the gradient of the line segment joining the points $P(1, 2)$ and $Q(3, 4)$.

# 4 Classwork/Homework

Year 12 Awesome Maths Textbook

- Ex. 13A Q2-11, 14, 15.