

# Integration (AS)

H1 Know and use the Fundamental Theorem of Calculus.

H2 Integrate  $x^n$  (excluding  $n = -1$ ), and related sums, differences and constant multiples.

H3 Evaluate definite integrals; use a definite integral to find the area under a curve.

For a brief commentary on this content go to the [MEI outline SoW](#).

## Pre-requisites

- GCSE: Rules of indices.
- AS Differentiation: Ensure fluency.

## Teaching it!

- A series of five [videos](#) designed to support students on this topic.
- [Calculus card match](#): Using index and surd form in differentiation and integration ([Solution](#)).
- [Definite integral sliders](#): A GeoGebra file designed to get students thinking.
- [Meaningful areas](#): An integration based investigation from Underground Mathematics.
- Area under a curve (student task): [Autograph](#), [Casio](#), [Desmos](#), [GeoGebra](#)

## Common student errors

- Mixing up the rules for differentiation and integration.
- Omitting the constant of integration.
- Incorrect use of negative indices when rewriting expressions, e.g. writing  $\frac{1}{2x}$  as  $2x^{-1}$  rather than  $\frac{1}{2}x^{-1}$ .
- Incorrect integration of constants.

## Getting them thinking

- Is it ever false that  $\frac{d}{dx}(\int y dx) = y$ ?
- Give me an example of a curve for which  $\int_{-2}^0 y dx = -\int_0^2 y dx$ .
- $\int_0^2 1 - x dx = 0$ . Make up a similar example. ([GeoGebra](#) file to illustrate.)
- Prove the Fundamental Theorem of Calculus.
- Prove that  $\int_0^a x^n dx = -\int_{-a}^0 x^n dx$ .