

# Integration

# Opposites

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## Differentiation

First Step: **MULTIPLY** coefficient by power

Last Step: **SUBTRACT** 1 from the power

## Integration

First Step: **ADD** 1 to the power

Last Step: **DIVIDE** coefficient by new power

$$y = 2x^3 + 5x^2 - 3x + 1$$

$$\frac{dy}{dx} = 6x^2 + 10x - 3$$

× by dx

× by dx

$$| dy = (6x^2 + 10x - 3) dx$$

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intrgate this side

$$\int dy = \int (6x^2 + 10x - 3) dx$$

this is known as an integral

$$y = \int (6x^2 + 10x - 3) dx$$

$$y = \frac{6x^3}{3} + \frac{10x^2}{2} - 3x + C$$

$$y = 2x^3 + 5x^2 - 3x + C$$

## Integration

Integration is the reverse of differentiation. It undoes the process of carrying out the differentiation.

### Rule for Integration

$$\int ax^n dx = \frac{ax^{n+1}}{n+1} + C$$

- to integrate you **ADD** one to the power/index number
- then divide by the **NEW** power/index number
- **ADD 'C'** - the constant of integration.

What you integrate is called the integral.

$$\int ax^n dx$$

this is called the integral

## Integration

### Examples

Integrate the following integrals and give your answer with a positive index.

1)  $\int 3x^3 \, dx$

$$= \frac{3x^4}{4} + C \quad \text{or} \quad \frac{3}{4}x^4 + C$$

$$2) \int 8x^5 dx$$

$$= \frac{8x^6}{6} + C$$

$$= \frac{4x^6}{3} + C$$

$$\underline{\underline{\hspace{15em}}}$$

$$\text{OR} = \frac{4}{3} x^6 + C$$

$$3) \int 7 \, dh$$

$$= 7h + C$$



$$4) \int -4y^{-3} dy$$

$$= \frac{-4y^{-2}}{-2} + C$$

$$= 2y^{-2} + C$$

$$= \frac{2}{y^2} + C$$

## Integrating

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$$5) \int 5b^{\frac{3}{4}} db$$

$$\frac{3}{4} + \frac{4}{4} = \frac{7}{4}$$

$$= \frac{5b^{\frac{7}{4}}}{\frac{7}{4}} + C$$

$$= \frac{4}{7} \times \underline{5} b^{\frac{7}{4}} + C$$

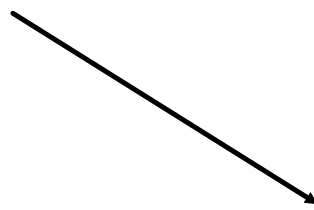
$$= \frac{20}{7} b^{\frac{7}{4}} + C$$

$$6) \int 12c^{-\frac{3}{5}} dc \qquad -\frac{3}{5} + \frac{5}{5}$$
$$= \frac{2}{5}$$

$$= \frac{12c^{\frac{2}{5}}}{\frac{2}{5}} + C$$

$$= \frac{5}{2} \times 12c^{\frac{2}{5}} + C$$

$$= 30c^{\frac{2}{5}} + C$$


$$\frac{5}{\sqrt{c^2}}$$

$$\begin{aligned} 7) \quad & \int 9x^{-\frac{7}{4}} dx && -\frac{7}{4} + \frac{4}{4} \\ & && = -\frac{3}{4} \\ & = \frac{9x^{-\frac{3}{4}}}{-\frac{3}{4}} + C \\ & = -\frac{4}{3} \times 9x^{-\frac{3}{4}} + C \\ & = -12x^{-\frac{3}{4}} + C \end{aligned}$$

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