

Integration:

Integration is the reverse of differentiation

$$\int x^n dx = \frac{x^{n+1}}{n+1} + c \quad \leftarrow \text{Constant of integration}$$

e.g. Given that

$$f'(x) = 8x^3 - 6x \text{ and that } f(2) = 9 \text{ find } f(x)$$

$$\begin{aligned} f(x) &= \int 8x^3 - 6x \, dx \\ &= \frac{8x^4}{4} - \frac{6x^2}{2} + c \\ &= 2x^4 - 3x^2 + c \end{aligned}$$

To find c use $f(2) = 9$

$$32 - 12 + c = 9$$

$$c = -11$$

$$\text{So } f(x) = 2x^4 - 3x^2 - 11$$

Not all questions will ask you to find the value of C .

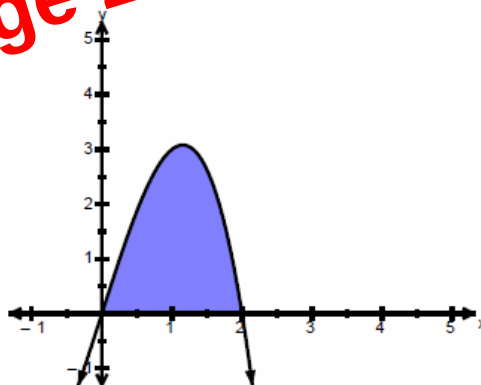
However always make sure you write $+ C$ in your answer

The area under a graph can be found using integration

The area under the graph of $y=f(x)$ between $x=a$ and $x=b$ is found by evaluating the definite integral

e.g. find the area under the curve of $y=4x-x^3$ between the lines $x=0$ and $x=2$

$$\begin{aligned} \int_0^2 (4x - x^3) \, dx &= \\ &= 2x^2 - \frac{x^4}{4} \\ &= (8 - 4) - (0 - 0) \\ &= 4 \end{aligned}$$



Remember: an area below the x axis has a **NEGATIVE VALUE**