Integration

NEED TO KNOW : Very basic summary

$$\text{if } y = f(x) = x^n$$

$$\boxed{\int y\,dx = \frac{x^{n+1}}{n+1}}$$

Integration is the reverse of differentiation. Example

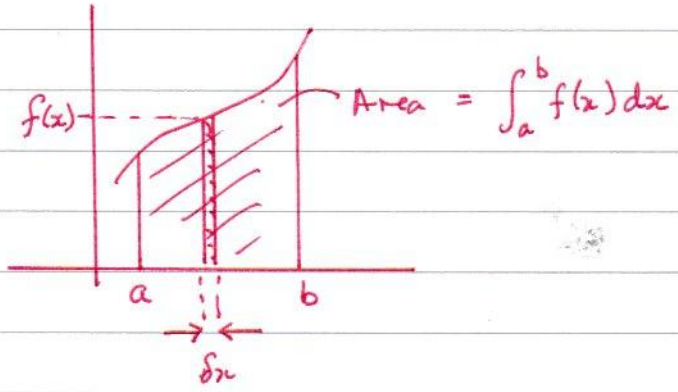
$$y = x^5 \qquad \frac{dy}{dx} = 5x^4$$

$$\int 5x^4\,dx = 5\frac{x^5}{5} + C = x^5 + C$$

There is always a constant of integration as the differential of a constant is zero. See explanatory note in Example 1.

Geometrically. $f'(x)$ gives the gradient of the tangent at x.

$\int_a^b f(x)\,dx$ gives the area under the $f(x)$ curve between the limits a and b



Imagine dividing the area up into many thin strips of width δx. The area of each strip $= f(x)\,\delta x$

So the total area is $\lim_{\delta x \to 0} \sum f(x)\,\delta x$ $\quad \Sigma$ = sum, $\searrow$ Σ turns into $\int$

This "sum" when $\delta x \to 0$ is the integral $\int f(x)\,dx$