Integration rules

Reverse of differentiation

Find the derivative of $f(x) = x^3$ and $f(x) = x^3 + 10$.

Indefinite integral:

$$\int \boldsymbol{f'(x)\,dx = f(x) + C}$$

C is constant.
Derivative of a constant is 0.

$$\int \boldsymbol{x^n\,dx = \frac{x^{n+1}}{n+1} + C}$$

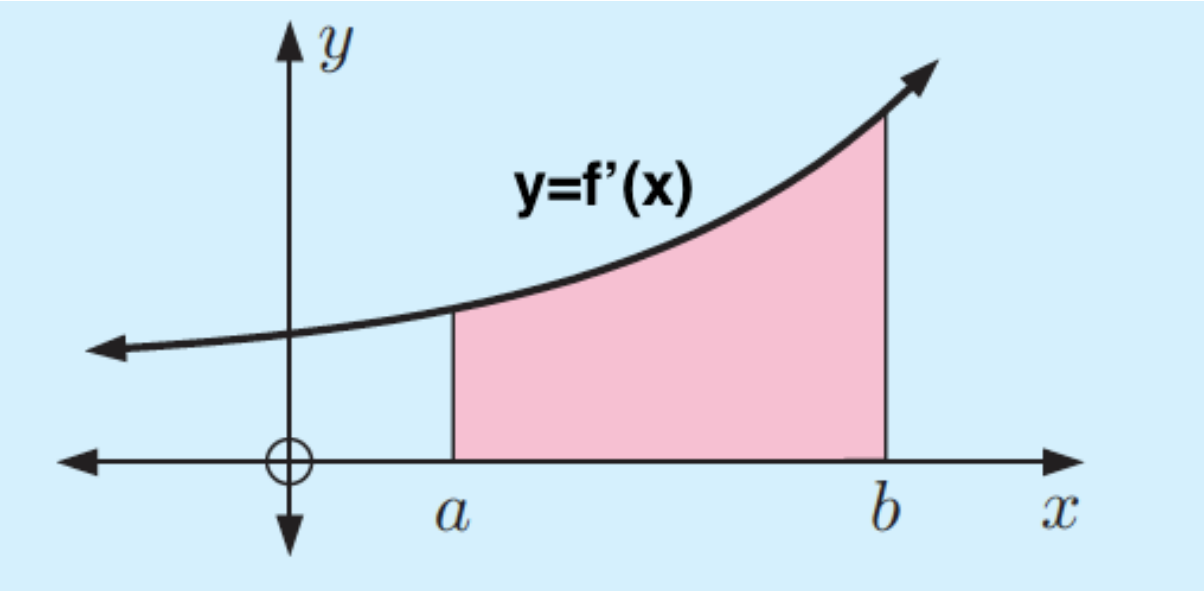
1. Find $\int 3x^2\,dx$.

2. Find $\int 5x^6 + 20\,dx$.

Definite integral:

$$\int_a^b f'(x)\,dx$$

Find the area under the curve.



The area below the curve between the line $x = b$ and $x = a$.

$$\int_a^b f'(x)\,dx$$
$$= [f(x)]_a^b$$
$$= f(b) - f(a)$$

1. Find the area between x-axis and $f(x) = x^4$ from $x = 1$ to $x = 3$.

2. Find the area between x-axis and $f(x) = -x^2 + 4x + 2$ from $x = 0$ to $x = 2$.

Paper 1

1. Let $f'(x) = 12x^2 - 2$. Given that $f(-1) = 1$, find $f(x)$.

2. Let $f'(x) = 6x^2 - 5$. Given that $f(2) = -3$, find $f(x)$.

Paper 2

1. A gradient function is given by $\frac{dy}{dx} = 10e^{2x} - 5$.
When $x = 0, y = 8$. Find the value of y when $x = 1$.

2. (calculator) Let $f(x) = \sqrt[3]{x^4} - \frac{1}{2}$.

(a) Find $f'(x)$.

(b) Find $\int f(x)dx$.