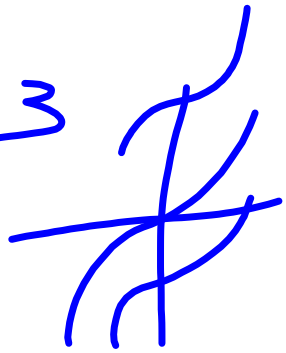
Antiderivatives

A function F is an **antiderivative** of f on an interval when F'(x)=f(x) for all x in the interval.

$F(x) = x^3 \quad \frac{d}{dx} F(x) = 3x^2$

$x^3 \qquad x^3+25 \qquad x^3-3$



$$G(x) = x^2 + C$$

constant of integration

family of antiderivatives

Differential Equations: involve x, y, and the derivatives of y.

$$y' = 3x$$

$$y' = x^2 + 1$$

Find the general solution of the differential equation

$y'=2$

$y = 2x + C$

- Antidifferentiation
- indefinite integral

$\frac{dy}{dx} = f(x)$

$dy = f(x)dx$

$$\int f(x)\,dx = F(x) + C$$

variable of integration

constant of integr.

integral

antiderivative

$\int 5\,dx$

$5x+C$

Rules $\int k\,dx$

$kx + c$

$$\int 3x\,dx$$

$$3\int x\,dx$$

$$3\left(\frac{x^2}{2}\right)+C$$

$$\frac{3x^2}{2}+C$$

$$\int \frac{1}{x^3} = \int x^{-3}$$

$$\frac{x^{-2}}{-2} + C$$

$$-\frac{1}{2x^2} + C$$

$$\int \sqrt{x}$$

$$\int x^{\frac{1}{2}} = \frac{x^{\frac{3}{2}}}{\frac{3}{2}} + C = \frac{2\sqrt{x^3}}{3} + C$$

$$\int 2\sin x \, dx$$

$$-2\cos x + C$$

$$\int (3x^4 - 5x^2 + x)\,dx$$

$$\frac{3x^5}{5} - \frac{5x^3}{3} + \frac{x^2}{2} + C$$

$$\int \frac{x+1}{\sqrt{x}}\,dx$$

$$\int (x+1)(x^{-1/2})$$

$$\int x^{1/2} + x^{-1/2}$$

$$\frac{x^{3/2}}{\frac{3}{2}} + \frac{x^{1/2}}{\frac{1}{2}}$$

$$\frac{2x^{3/2}}{3} + 2x^{1/2} + C$$

$$\int \frac{\sin x}{\cos^2 x}\,dx$$

$$\int \frac{1}{\cos x}\frac{\sin x}{\cos x}\,dx$$

$$\int \sec x \tan x\,dx$$

$$\sec x + C$$