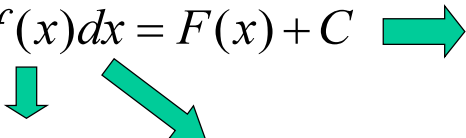


Definition of Antiderivative: A function F is called an antiderivative of the function f if for every x in the domain of f

$$F'(x) = f(x) \text{ so, } dy = f(x) dx$$

Integration is denoted by an integral sign \int .

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



Integrand **Variable of Integration** **Constant of Integration**

$F'(x) \text{ also} = f(x)$
(first derivative)

Basic Integration Formulas

$$\int 0 dx = C$$

$$\int k dx = kx + C$$

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

$$\int \cos x dx = \sin x + C$$

$$\int \sec x \tan x dx = \sec x + C$$

$$\int \sin x dx = -\cos x + C$$

$$\int \csc^2 x dx = -\cot x + C$$

$$\int \sec^2 x dx = \tan x + C$$

$$\int \csc x \cot x dx = -\csc x + C$$

Integrate

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

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

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

$$\int 2 \sin x dx = 2 \int \sin x dx = 2(-\cos x) + C = -2 \cos x + C$$

$$\int 1 dx = x + C$$

$$\int (x + 2) dx = \frac{x^2}{2} + 2x + C$$

$$\int (3x^4 - 5x^2 + x) dx = \frac{3x^5}{5} - \frac{5x^3}{3} + \frac{x^2}{2} + C$$

Find the general solution of the equation $F'(x) = \frac{1}{x^2}$ and find the particular solution given the point $F(1) = 0$.

$$F(x) = \int \frac{1}{x^2} dx = \int x^{-2} dx$$

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

$$\therefore y = -\frac{1}{x} + C \quad \text{Now plug in (1,0) and solve for C.}$$

$$0 = -1 + C$$

$$C = 1$$

Final answer.

$$y = -\frac{1}{x} + 1$$

$$\begin{aligned}\int 12e^{4x} dx &= 12 \frac{e^{4x}}{4} + C \\ &= 3e^{4x} + C\end{aligned}$$

$$\begin{aligned} z &= \int \left(6x^2 + \frac{3}{x} \right) dx \\ &= \int 6x^2 dx + \int \frac{3}{x} dx \\ &= \frac{6x^3}{3} + 3 \ln x + C \\ &= 2x^3 + 3 \ln x + C \end{aligned}$$

$$\begin{aligned} I &= \int_0^1 8xe^{-2x} dx \\ &= 8 \frac{e^{-2x}}{(2)^2} [-2x - 1]_0^1 \\ &= 2e^{-2} [-2(1) - 1] - 2e^{-0} [0 - 1] \\ &= -6e^{-2} + 2 = 1.188 \end{aligned}$$