

1 Review of Integration

$$\int_a^b f(x) dx = \lim_{|P| \rightarrow 0} \sum_{i=1}^n f(x_i^*) \Delta x_i$$

$$\frac{d}{dx} \left(\int_a^x f(t) dt \right) = f(x)$$

If $F' = f$, then $\int_a^b f(x) dx = F(b) - F(a)$

$$\begin{array}{ll} \int x^n dx = \frac{1}{n+1} x^{n+1} + C \quad (n \neq -1) & \int e^x dx = e^x + C \\ \int \sin x dx = -\cos x + C & \int a^x dx = \frac{1}{\ln a} a^x + C \\ \int \cos x dx = \sin x + C & \int \frac{1}{x} dx = \ln |x| + C \\ \int \sec^2 x dx = \tan x + C & \int \frac{1}{\sqrt{1-x^2}} dx = \sin^{-1} x + C \\ \int \csc^2 x dx = -\cot x + C & \int \frac{1}{1+x^2} dx = \tan^{-1} x + C \\ \int \sec x \tan x dx = \sec x + C & \int \frac{1}{x\sqrt{x^2-1}} dx = \sec^{-1} x + C \\ \int \csc x \cot x dx = -\csc x + C & \end{array}$$

Examples:

Find $F'(x)$ given: $F(x) = \int_{\pi}^x \frac{1}{1+t^4} dt$

Evaluate $\int_{-1}^2 (4 - x^2) dx$

Evaluate $\int_0^{\pi/2} (\cos x + 4 \sin x) dx$

Evaluate $\int_{-e}^{-1} \frac{1}{x} dx$

Compute $\int \left(2\sqrt{x} - \frac{1}{\sqrt{x}} + \frac{3}{\sqrt{1-x^2}} \right) dx$

On Beyond Average:

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

$$\int \sec x (\sec x + \tan x) dx$$

The graph of a function f is shown below. If $g(x) = \int_a^x f(t) dt$, find the intervals where g is increasing, decreasing, concave up, concave down, and sketch the graph of g .

