University of Mila

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Mathematics Statistics

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<u>Exercises Serie N° 2</u>

Exercise 1

Use direct calculus to find the primitives

❶ $\int \frac{x^3-1}{x^2}dx$

❷ $\int \frac{x}{\sqrt{(x^2+5)^3}}dx$

❸ $\int \frac{3e^x}{1+e^{2x}}dx$

❹ $\int \frac{1}{x(\ln x)^{\frac{2}{3}}}dx$

❺ $\int 1+\tan^2 x dx$

❻ $\int \frac{\sin x}{\sqrt{\cos x}}dx$

Exercise 2

Using integration by parts, calculate the following integrals:

❶ $\int x\sin(x)dx$

❷ $\int 2xe^{-x}dx$

❸ $\int \ln(1+x)dx$

❹ $\int x\arctan(x)dx$

Exercise 3

Make the change of variable to calculate the following integrals:

❶ $\int \frac{e^{\sqrt{x}}}{\sqrt{x}}dx$

❷ $\int \cos(6x)\sqrt{1+\sin(6x)}dx$

❸ $\int \frac{1}{\sqrt{x}}\ln(1+\sqrt{x})dx$

❹ $\int \frac{\tan x}{1+\cos x}dx$

Exercise 4

Let the function f defined on $\mathbb{R}$ by:

$$f(x) = \frac{e^x-2}{e^x+1}$$

❶ Determine the real numbers a, and b, such that for all x, $f(x) = a+b\frac{e^x}{e^x+1}$

❷ Determine all the primitives of f on $\mathbb{R}$

Exercise 5

Calculate the following integrals:

❶ $\int\limits_{1}^{2} \frac{\ln x}{x} dx$

❷ $\int\limits_{0}^{1} \frac{x^3+x+1}{1+x^2} dx$

❸ $\int\limits_{-\frac{\pi}{4}}^{\frac{\pi}{4}} \sin^2 x \, dx$

❹ $\int\limits_{-1}^{2} |x^3 - x| \, dx$

❺ $\int\limits_{-1}^{1} 5x^4 \sqrt{x^5 + 1} \, dx$

❻ $\int\limits_{0}^{1} \frac{3x+1}{(x+1)^2} dx$