CALCULUS

GLOBAL GOVERNANCE

A.Y. 2024/25

Tutorial nr. 5

Exercise 1.

Compute the following integrals by parts:

(a) $\int \frac{x}{\sqrt{x+2}}\, dx$ (b) $\int_1^e \frac{\ln x}{x^2}\, dx$ (c) $\int x^3 e^{-x^2}\, dx$ (d) $\int_0^1 x\left(e^{-2x} - e^x\right)\, dx$

Exercise 2. Matthew Salwyin, the racist and hateful politician whom we met in exercise 3 of tutorial 4, must repay a debt of 49 million euros to the State due to tax evasion by his party. His cunning collaborator, the finance minister Jean-Charles Georgette, proposes to invest in a particularly advantageous Luxembourg fund with an annuity of 5 million euros (that they plan to illegally siphon from educational policies) that earns interest at an annual rate of 8%, compounded continuously.

(i) Assuming the annuity is deposited continuously into the account, how much time T (in years) will be needed to have enough money to repay the debt?

(ii) Supposing that they need to repay the debt before the end of the legislatura (in 3 years), otherwise they will go to jail, what should the annuity be?