CALCULUS

GLOBAL GOVERNANCE

A.Y. 2025/26

Recitation V

Exercise 1 (Integrals)

(i) Compute the following indefinite integrals:

(**a**) $\int \left(\frac{1}{3x} - 2x\sqrt[3]{x} + 1 \right) dx$ (**b**) $\int \left(e^{\frac{t}{2}} + 2 \right)^2 dt$ (**c**) $\int \left(3\sin y + \frac{y^2+1}{2\sqrt{y}} \right) dy.$

(ii) Compute the following indefinite integrals by substitution:

(**a**) $\int 3y\sqrt{y^2+9}\, dy$ (**b**) $\int (3x^2-1)e^{(x^3-x)}\, dx$ (**c**) $\int \frac{z\ln(1+z^2)}{z^2+1}\, dz.$

(iii) 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. A roast is removed from the freezer of a refrigerator and left on the counter to defrost. The temperature of the roast was $-4°$C when it was removed from the freezer and t hours later, was increasing at the rate of

$$T'(t) = 7e^{-0.35t}\,{}^\circ\text{C/hr}$$

(i) Find a formula for the temperature of the roast after t hours.

(ii) What is the temperature after 2 hours?

(iii) Assume the roast is defrosted when its temperature reaches $10°$C. How long does it take for the roast to defrost?