MAT133
Midterm exam 2021
Duration : 1h
(No calculator, no document)
The number of points is tentative (indicatif)
Please write down your group number

Exercice 1 (Percentages, 4 points). *1) A phone costs 150 euros. Its price drops (baisse) by 30 percent. What is its new price?*
2a) After a 20 percent discount, the price of a TV set (téléviseur) is 840 euros. What was its price before the discount?
2b) The price of the TV comes back to its initial price. What is the percentage of increase (compared to the price after the discount)?

Exercice 2 (Equations/Inequations, 8 points). *The three questions are independent.*

1) Solve in $\mathbb{R}$ the equation $2x^2 + 5x - 3 = 0$, then $2x^3 + 5x^2 - 3x = 0$ and then $2e^{2x} + 5e^x - 3 = 0$.

2) Solve in $\mathbb{R}$ the inequation $\dfrac{1}{x-1} < 1$ (please explicit the set of definition of the inequation).

3) Solve in $\mathbb{R}$ the equation $\ln(x+2) + \ln(3) = \ln(x)$ (please explicit the set of definition of the equation and start with writing a simple expression of $\ln(x+2)+\ln(3)$).

Exercice 3 (Derivatives, 5 points). *Please write down the set of definition and the set of differentiability (the set where the function is differentiable) of the following functions. Then compute their derivative.*

$$f(x) = \sqrt{x^2 - 4}$$
$$g(x) = \frac{3x + 1}{x - 2}$$
$$h(x) = (3x + 1)e^{2x^2 - 1}$$
$$j(x) = \ln(x^2 - 7x + 12)$$

Exercice 4 (Study of function, 3 points). *Let $f(x) = e^{x^2 + 2x}$.*
1) Find the set of definition of f then write down the "tableau des variations" of f.
2) Does the function f have a minimum ? a maximum ?
3) Does it exist $x \in \mathbb{R}$ such that $f(x) = \dfrac{1}{3}$ (justify). Numerical hint : $e \sim 2,7$