INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

SCAN 2 — Quiz #7 — 10'

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Exercise 1. Find all functions $f : \mathbb{R}^3 \to \mathbb{R}$ of class C^1 such that

$$(*) \qquad \partial_2 f + 4f = 0.$$

No justifications required.

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the general solution of class C^1 of $(*)$ is :

$$f : \mathbb{R}^3 \longrightarrow \mathbb{R}$$
$$(x,y,z) \longmapsto A(x,z)\, e^{-4y}$$

where $A : \mathbb{R}^2 \longrightarrow \mathbb{R}$ is of class C^1

Exercise 2. Let f be the function defined by

$$f : \begin{array}{ccc} \mathbb{R}^3 & \longrightarrow & \mathbb{R} \\ (a,b,c) & \longmapsto & ab^2 e^{bc}. \end{array}$$

Let $(x,y,z) \in \mathbb{R}^3$. Compute (please mind the name of the variables):

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$$\partial^2_{2,3} f(x,y,z) = 3xy^2 e^{yz} + xy^3 z\, e^{yz}$$

Exercise 3. Let f be the function defined by

$$f : \begin{array}{ccc} \mathbb{R}^3 & \longrightarrow & \mathbb{R} \\ (x,y,z) & \longmapsto & x^3 - 2xy + yz + z^2. \end{array}$$

Let $\mathscr{S}$ be the surface in $\mathbb{R}^3$ of equation

$$\mathscr{S} \; : \; f(x,y,z) = -1.$$

1. Give the gradient vector of f at $(1,1,-1)$.

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$$\vec{\nabla} f(1,1,-1) = \vec{e}_1 - 3\vec{e}_2 - \vec{e}_3$$

2. Deduce an equation of the tangent plane (P) to $\mathscr{S}$ at $(1,1,-1)$. You don't neet to check that $(1,1,-1) \in \mathscr{S}$. No justifications required.

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$$(P) : \quad x - 3y - z = -1$$