1. Consider the function $h : \mathrm{R} \rightarrow \mathrm{R}$, where $h(t) = (f \circ g)(t) = f(g(t))$ with **5 / 5 puntos**

$$g(t) = \mathbf{x} = \begin{bmatrix} t\cos t \\ t\sin t \end{bmatrix}, \quad t \in \mathrm{R}$$

$$f(\mathbf{x}) = \exp(x_1 x_2^2), \quad \mathbf{x} = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \in \mathrm{R}^2$$

- [ ] $\frac{dh}{dt} = \cos t - t\sin t + 2t\sin t(\sin t + t\cos t)$

- [ ] $\frac{dg}{dt} = \begin{bmatrix} \sin t - t\cos t \\ \cos t + t\sin t \end{bmatrix}$

- [x] $\frac{dh}{dt} = \frac{df}{dg}\frac{dg}{dt}$

Correcto
Yes, this is exactly what the chain-rule says.

- [x] $\frac{dh}{dt} = \exp(x_1 x_2^2)[x_2^2(\cos t - t\sin t) + 2x_1 x_2(\sin t + t\cos t)]$ with $x_1 = t\cos t,\ x_2 = t\sin t$

Correcto
Yes, this is what we get when we apply the chain-rule. Well done!

- [x] $\frac{dg}{dt} = \begin{bmatrix} \cos t - t\sin t \\ \sin t + t\cos t \end{bmatrix}$

Correcto
Well done

- [x] $\frac{df}{d\mathbf{x}} = [x_2^2\exp(x_1 x_2^2) \quad 2x_1 x_2\exp(x_1 x_2^2)]$

Correcto
Yes, this is a row vector.

☐ $\frac{df}{d\mathbf{x}} = [x_1 x_2^2 \quad 2x_2 x_1 x_2^2]$

2. **Compute $\frac{df}{dx}$ of the following function using the chain rule.** **1 / 1 punto**

$a = x^2$

$b = \exp(a)$

$c = a + b$

$d = \log(c)$

$e = \sin(c)$

$f = d + e$

○ $\frac{df}{dx} = \frac{(1 + \cos(x^2 + \exp(x^2))(x^2 + \exp(x^2)))(2x + 2x\exp(x^2))}{x^2 + \exp(x^2) + \log(x^3)}$

○ $\frac{df}{dx} = \frac{(1 + \cos(x^2 + \exp(x^2))(x^2 + \exp(x^2)))(2x + 2x\exp(x^2))}{x^2}$

◉ $\frac{df}{dx} = \frac{(1 + \cos(x^2 + \exp(x^2))(x^2 + \exp(x^2)))(2x + 2x\exp(x^2))}{x^2 + \exp(x^2)}$

✓ **Correcto**
Excellent!

3. What is $\frac{df}{dx}$ where **1 / 1 punto**

$f = \cos(t^2)$

$t = x^3$

- ○ $-6x \sin(x^6)$
- ◉ $-6x^5 \sin(x^6)$
- ○ $-\sin(x^6)$
- ○ $6x^5 \sin(x^6)$

Correcto
Well done!