Your grade: 100%

Your latest: **100%** • Your highest: **100%** • To pass you need at least 80%. We keep your highest score.

Next item →

1. Consider the function $h : \mathbb{R} \to \mathbb{R}$, where $h(t) = (f \circ g)(t) = f(g(t))$ with

5 / 5 points

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

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

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

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

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

Correct
Yes, this is a row vector.

- [ ] $\frac{df}{d\mathbf{x}} = \begin{bmatrix} x_1 x_2^2 & 2x_2 x_1 x_2^2 \end{bmatrix}$
- [x] $\frac{dg}{dt} = \begin{bmatrix} \cos t - t\sin t \\ \sin t + t\cos t \end{bmatrix}$

Correct
Well done

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

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

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

1 / 1 point

$a = x^2$

$b = \exp(a)$

$c = a + b$

$d = \log(c)$

$e = \sin(c)$

$f = d + e$

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

Correct

Excellent!

3. What is $\frac{df}{dx}$ where

1 / 1 point

$f = \cos(t^2)$

$t = x^3$

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

Correct

Well done!