Chain rule practice
Practice Quiz, 3 questions

✓ **Congratulations! You passed!** | Next Item |

✓   5 / 5
    points

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

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

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

☐ $\dfrac{df}{d\mathbf{x}} = \begin{bmatrix} x_1 x_2^2 & 2x_2 x_1 x_2^2 \end{bmatrix}$

▲

Un-selected is correct

☐ $\dfrac{dh}{dt} = \cos t - t \sin t + 2t \sin t (\sin t + t \cos t)$

▲

Un-selected is correct

☐ $\dfrac{dg}{dt} = \begin{bmatrix} \cos t - t \sin t \\ \sin t + t \cos t \end{bmatrix}$

▲

Correct
Well done

☐ $\dfrac{dh}{dt} = \dfrac{df}{dg} \dfrac{dg}{dt}$

▲

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

Chain rule practice

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

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7/7 points (100%)

Correct

Yes, this is a row vector.

☐ $\dfrac{dh}{dt} = \exp(x_1 x_2^2)\left[x_2^2(\cos t - t\sin t) + 2x_1 x_2(\sin t + t\cos t)\right]$ 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!

☐ $\dfrac{dg}{dt} = \begin{bmatrix} \sin t - t\cos t \\ \cos t + t\sin t \end{bmatrix}$

▲

Un-selected is correct

✔   1 / 1
point

2.

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

$a = x^2$

$b = \exp(a)$

$c = a + b$

$d = \log(c)$

$e = \sin(c)$

$f = d + e$

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

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

○

Chain rule practice

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

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7/7 points (100%)

Correct
Excellent!

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1 / 1
point

3.

What is $\dfrac{df}{dx}$ where

$f = \cos(t^2)$

$t = x^3$

- ○ $-\sin(x^6)$

- ○ $-6x^5 \sin(x^6)$

Correct
Well done!

- ○ $6x^5 \sin(x^6)$

- ○ $-6x \sin(x^6)$