

Chain rule practice

TOTAL POINTS 7

1.Question 1

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

$$g(t) = \mathbf{x} = [t\cos t], [t\sin t], t \in \mathbb{R}$$

$$f(\mathbf{x}) = \exp(x_1x_2^2), \mathbf{x} = [x_1], [x_2] \in \mathbb{R}_2$$

5 / 5 points

- ☒ $dh/dt = \exp(x_1x_2^2)[x_2^2(\cos t - t\sin t) + 2x_1x_2(\sin t + t\cos t)]$ with $x_1 = t\cos t, x_2 = t\sin t$
- ☐ $dg/dt = [\sin t - t\cos t], [\cos t + t\sin t]$
- ☐ $dh/dt = \cos t - t\sin t + 2t\sin t(\sin t + t\cos t)$
- ☒ $dh/dt = (df/dg)(dg/dt)$
- ☒ $df/d\mathbf{x} = [x_2^2\exp(x_1x_2^2)], [2x_1x_2\exp(x_1x_2^2)]$
- ☐ $df/d\mathbf{x} = [x_1x_2^2], [2x_2x_1x_2^2]$
- ☒ $dg/dt = [\cos t - t\sin t], [\sin t + t\cos t]$

2.Question 2

Compute df/dx of the following function using the chain rule.

$$\mathbf{a} = \mathbf{x}^2$$

$$\mathbf{b} = \exp(\mathbf{a})$$

$$\mathbf{c} = \mathbf{a} + \mathbf{b}$$

$$\mathbf{d} = \log(\mathbf{c})$$

$$\mathbf{e} = \sin(\mathbf{c})$$

$$\mathbf{f} = \mathbf{d} + \mathbf{e}$$

1 / 1 point

☐ $df/dx = [(1+\cos(x^2 + \exp(x^2))(x^2 + \exp(x^2)))(2x + 2x\exp(x^2))] / x^2+\exp(x^2)$

3.Question 3

What is $\frac{df}{dx}dxdf$ where

$f = \cos(t^2)$

$t = x^3$

1 / 1 point

☐ $6x^5 \sin(x^6)$

☒ $-6x^5 \sin(x^6)$

☐ $-6x \sin(x^6)$

☐ $-\sin(x^6)$