Congratulations! You passed!

TO PASS 80% or higher

Keep Learning

GRADE
100%

Multivariate chain rule exercise

TOTAL POINTS 5

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1. In this quiz, you will practice calculating the multivariate chain rule for various functions.

1 / 1 point

For the following functions, calculate the expression $\frac{df}{dt} = \frac{\partial f}{\partial \mathbf{x}} \frac{d\mathbf{x}}{dt}$ in matrix form, where $\mathbf{x} = (x_1, x_2)$.

$f(\mathbf{x}) = f(x_1, x_2) = x_1^2 x_2^2 + x_1 x_2$

$x_1(t) = 1 - t^2$

$x_2(t) = 1 + t^2$

◉ $\frac{df}{dt} = \frac{\partial f}{\partial \mathbf{x}} \frac{d\mathbf{x}}{dt} = [2x_1 x_2^2 + x_2, 2x_1^2 x_2 + x_1] \begin{bmatrix} -2t \\ 2t \end{bmatrix}$

○ $\frac{df}{dt} = \frac{\partial f}{\partial \mathbf{x}} \frac{d\mathbf{x}}{dt} = [2x_1 x_2^2 + x_2, 2x_1^2 x_2 + x_1] \begin{bmatrix} 2t \\ -2t \end{bmatrix}$

○ $\frac{df}{dt} = \frac{\partial f}{\partial \mathbf{x}} \frac{d\mathbf{x}}{dt} = [2x_1^2 x_2 + x_1, 2x_1 x_2^2 + x_2] \begin{bmatrix} -2t \\ 2t \end{bmatrix}$

○ $\frac{df}{dt} = \frac{\partial f}{\partial \mathbf{x}} \frac{d\mathbf{x}}{dt} = [2x_1^2 x_2 + x_1, 2x_1 x_2^2 + x_2] \begin{bmatrix} 2t \\ -2t \end{bmatrix}$

✓ **Correct**

Well done!

2. For the following functions, calculate the expression $\frac{df}{dt} = \frac{\partial f}{\partial \mathbf{x}} \frac{d\mathbf{x}}{dt}$ in matrix form, where $\mathbf{x} = (x_1, x_2, x_3)$.

1 / 1 point

$f(\mathbf{x}) = f(x_1, x_2, x_3) = x_1^3 cos(x_2) e^{x_3}$

$x_1(t) = 2t$

$x_2(t) = 1 - t^2$

$x_3(t) = e^t$

○ $\frac{df}{dt} = \frac{\partial f}{\partial \mathbf{x}} \frac{d\mathbf{x}}{dt} = [3x_1^2 cos(x_2) e^{x_3}, -x_1^3 cos(x_2) e^{x_3}, x_1^3 cos(x_2) e^{x_3}] \begin{bmatrix} 2 \\ 2t \\ e^t \end{bmatrix}$

○ $\frac{df}{dt} = \frac{\partial f}{\partial \mathbf{x}} \frac{d\mathbf{x}}{dt} = [3x_1^2 cos(x_2) e^{x_3}, x_1^3 cos(x_2) e^{x_3}, x_1^3 sin(x_2) e^{x_3}] \begin{bmatrix} 2 \\ 2t \\ -e^t \end{bmatrix}$