

Mathematical analysis 2, WNE, 2018/2019
meeting 11. – homework solutions

26 March 2019

Group 8:00

Calculate the derivative of $g \circ f$, for $f: \mathbb{R}^2 \rightarrow \mathbb{R}^3$, $f(x, y) = (x^2 - y^2, x^2 + y^2, x^2 y^2)$, $g: \mathbb{R}^3 \rightarrow \mathbb{R}$, $g(a, b, c) = ab + bc + ac$.

$$g(f(x)) = x^4 - y^4 + x^4 y^2 + x^2 y^4 + x^4 y^2 - x^2 y^4 = x^4 - y^4 + 2x^4 y^2, \text{ thus } (g \circ f)' = [4x^3 + 8x^3 y^2, -4y^3 + 4x^4 y].$$

Group 9:45

Calculate the derivative of $g \circ f$, for $f: \mathbb{R}^2 \rightarrow \mathbb{R}^3$, $f(x, y) = (x - y, x + y, 2\sqrt{xy})$, $g: \mathbb{R}^3 \setminus \{0\} \rightarrow \mathbb{R}$, $g(a, b, c) = \ln(a^2 + b^2 + c^2)$.

$$g(f(x)) = \ln(x^2 - 2xy + y^2 + x^2 + 2xy + y^2 + 4xy) = \ln(2x^2 + 4xy + 2y^2) = \ln(2(x + y)^2), \text{ thus } (g \circ f)' = [4(x + y)/2(x + y)^2, 4(x + y)/2(x + y)^2] = [2/(x + y), 2/(x + y)].$$