

Mathematics for Machine Learning: Homework 7

Deadline is 03.09.2020

August 25, 2020

1. Calculate the limit of $f(x, y)$ at the point (a, b) .

a) $f(x, y) = \frac{\sin(xy)}{x}, (a, b) = (0, 1),$

b) $f(x, y) = (x^2 + y^2)^{x^2 y^2}, (a, b) = (0, 0),$

c) $f(x, y) = \frac{x + y}{x^2 - xy + y^2}, (a, b) = \infty,$

d) $f(x, y) = (x + y)e^{-(x^2 + y^2)}, (a, b) = \infty.$

2. Let $f(x, y) = x^2 - y^2$. Find the directional derivative of f with respect to the unit vector v which origin is $(1, 1)$ and the angle between v and Ox axis is equal to 60° .

3. Find local extremum and saddle points of the function f .

a) $f(x, y) = x^2 + (y - 1)^2$ c) $f(x, y) = x^2 y^3 (6 - x - y),$

b) $f(x, y) = 2x^4 + y^4 - x^2 - 2y^2,$ d) $f(x, y) = xy + \frac{50}{x} + \frac{20}{y}.$

4. Two fair dice are rolled. What is the probability that at least one lands on 6 given that the dice land on different numbers?
5. If two fair dice are rolled, what is the probability that the first one lands on 6 given that the sum of the dice is i ? Compute for all values of i between 7 and 12.
6. An urn contains 6 white and 9 black balls. If 4 ball are to be randomly selected without replacement, what is the probability that the first 2 selected are white and the last 2 black?