

Übungen Grundkurs Mathematik für Informatiker 2. Semester

Übungsaufgaben: Differenzierbarkeit von Funktionen

1. Differenzieren Sie, bestimmen Sie den Definitionsbereich der Funktion und deren Ableitung

1.1. $f_1(x) = 3x^4 - 1 + 4x\sqrt[3]{x^2} + \frac{\sqrt{x} + 1}{x^2},$

$$f_2(x) = x^2 e^x, \quad f_3(t) = \frac{1}{t^2 - 1},$$

$$f_4(u) = \frac{u}{u^2 + 1}, \quad f_5(x) = \sin(x^2 - 1), \quad f_6(x) = \sin^3(x^2 - 1),$$

$$a = \text{const}, a > 1: \quad f_7(x) = a^x, \quad f_8(x) = x^a,$$

$$f_9(x) = x^x, \quad f_{10}(x) = x^{\tan x}, \quad f_{11}(x) = g(x)^{h(x)}.$$

1.2. $f_1(x) = 5x^3 - 2 + 2x\sqrt{x^3} - \frac{2}{x^3}, \quad f_2(x) = \frac{1 + x\sqrt{x} + \sqrt[3]{x^{-2}}}{x^2},$

$$s = f_3(t) = \frac{\cos t}{1 - \sin t}, \quad f_4(x) = \sqrt{\frac{1-x}{1+x}}, \quad s = f_5(t) = \ln \sin \omega t,$$

$$f_6(x) = \frac{\sin x + \cos x}{\sin x - \cos x}, \quad f_7(x) = x^3(x^2 - 1)^3, \quad u = f_8(t) = \sin^2 \omega t,$$

$$f_9(u) = 2^{\sin 3u}, \quad f_{10}(x) = \frac{\cos x}{\sin^2 x} + \ln \tan \frac{x}{2},$$

$$f_{11}(x) = \arccos \frac{1-x^2}{1+x^2} - 2 \arctan x,$$

$$f_{12}(t) = \sqrt{1 + \sqrt{2pt}}, \quad f_{13}(x) = e^{\cos x} \sin x,$$

$$f_{14}(x) = \arcsin \frac{2x}{1+x^2}, \quad f_{15}(x) = \ln \frac{x^2 - 1}{x^2 + 1},$$

$$f_{16}(x) = 2^{\frac{x}{\ln x}}, \quad f_{17}(x) = x^{\sin x}, \quad f_{18}(x) = \ln x^{3x^3}.$$

2. Bestimmen Sie die n-te Ableitung von

$$f_1(x) = a^x, \quad f_2(x) = \ln x, \quad f_3(x) = x e^{-x}.$$