Mathematical analysis II - tutorial 2 1.3.2018

Problem 1: (Substitutions) Calculate the following integral (do not forget to determine the domain in which is your result valid):

a) $\int \sqrt[3]{1-3x}\,\mathrm{d}x$

b) $\int \sin^7 x \cos x\,\mathrm{d}x$

c) $\int xe^{-x^2}\,\mathrm{d}x$

d) $\int \frac{x^2}{(1-x)^{100}}\,\mathrm{d}x$

e) $\int \frac{x}{(1+x^2)^2\,\mathrm{d}x}$

f) $\int \frac{1}{\sqrt{8+6x-9x^2}\,\mathrm{d}x}$

Problem 2: (Substitutions) Calculate the following integral (do not forget to determine the domain in which is your result valid):

a) $\int \sqrt{1-x^2}\,\mathrm{d}x$

b) $\int \frac{1}{1+\sqrt{x}}\,\mathrm{d}x$

c) $\int \frac{1}{x\ln x}\,\mathrm{d}x$

Problem 3: (Gluing) Find a primitive function corresponding to the following functions on their whole domains:

a) $|\cos x|$

b) $|x-|x-1||$

Problem 4: (Rational functions) Calculate the following indefinite integrals and determine the domain on which is your result valid:

a) $\int \frac{1}{(3x+1)(x-1)}\,\mathrm{d}x$

b) $\int \frac{2x+3}{(x-2)(x+5)}\,\mathrm{d}x$

c) $\int \frac{x^4+1}{x^3-x^2+x-1}\,\mathrm{d}x$

d) $\int \frac{2x}{(x+1)(x^4+2x^2+1)}\,\mathrm{d}x$

e) $\int \frac{x}{(x^2+2x+2)^2(x^2+2x-3)}\,\mathrm{d}x$