Mathematical analysis II - tutorial 3 8.3.2018

Problem 1: (Rational functions continued) Calculate the following indefinite integrals and determine the domain on which is your result valid:

a) $\displaystyle\int \frac{x^3 - 4x - 6}{x^3 - 5x^2 + 6x}\,\mathrm{d}x$

b) $\displaystyle\int \frac{x^{17} - 5}{x^2 - 1}\,\mathrm{d}x$

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

d) $\displaystyle\int \frac{x^2 + x}{(1 + x^2)^3}\,\mathrm{d}x$

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

f) $\displaystyle\int \frac{1}{x^4 + 1}\,\mathrm{d}x$

Problem 2: (Standard substitutions) Calculate the following indefinite integrals on maximal domains:

a) $\displaystyle\int \frac{\sin x \cos x}{\sin^4 x + \cos^4 x}\,\mathrm{d}x$

b) $\displaystyle\int \frac{\sin x}{(1 - \cos x)^2}\,\mathrm{d}x$

c) $\displaystyle\int \frac{1}{1 + \tan x}\,\mathrm{d}x$

d) $\displaystyle\int \frac{1}{1 + 3\sin^2 x}\,\mathrm{d}x$

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

f) $\displaystyle\int \frac{1}{5 + 4\sin x}\,\mathrm{d}x$

g) $\displaystyle\int \frac{1}{1 + \sqrt{x + 3}}\,\mathrm{d}x$

h) $\displaystyle\int \sqrt{\frac{1 - x}{1 + x}}\,\frac{1}{x}\,\mathrm{d}x$

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

j) $\displaystyle\int \frac{x^2}{\sqrt{1 + x + x^2}}\,\mathrm{d}x$

k) $\displaystyle\int \frac{x - \sqrt{x^2 + 3x + 2}}{x + \sqrt{x^2 + 3x + 2}}\,\mathrm{d}x$