Math 21B
Kouba
Discussion Sheet 5

1.) Use any method to determine the following indefinite integrals (antiderivatives).

a.) $\int \frac{e^x}{e^x+1}\,dx$ b.) $\int \frac{e^{2x}}{e^x+1}\,dx$ c.) $\int \frac{e^x}{e^{2x}+1}\,dx$ d.) $\int \frac{e^{-x}+1}{xe^{-x}+1}\,dx$

e.) $\int \sec x\,dx$ f.) $\int \sec x \tan x\,dx$ g.) $\int \sec^2 x \tan x\,dx$ h.) $\int \sec^5 x \tan x\,dx$

i.) $\int \sec^5 x \tan^3 x\,dx$ j.) $\int \sec^2 x \tan^2 x\,dx$ k.) $\int (\cot^2 x + \tan^2 5x)\,dx$

l.) $\int (\sec 3x - \csc(\frac{x}{2}))\,dx$ m.) $\int \sin^2 4x\,dx$ n.) $\int \sin^3 x\,dx$ o.) $\int \cos^3 x \sin^2 x\,dx$

p.) $\int \frac{\cot^2 4x + 1}{\cot 4x}\,dx$ q.) $\int \frac{1}{\sin x \cos x}\,dx$ r.) $\int \frac{\sec^2 x}{\tan x}\,dx$ s.) $\int \frac{\sec^3 x}{\tan x}\,dx$

t.) $\int \frac{1}{\tan x}\,dx$ u.) $\int \frac{1}{1+\cos x}\,dx$ v.) $\int \sqrt{1+x}\,dx$ w.) $\int \frac{1}{\sqrt{1+x^2}}\,dx$

x.) $\int x\,\sqrt{1+x^2}\,dx$ y.) $\int \sqrt{1+\sqrt{1+x}}\,dx$ z.) $\int \frac{\sqrt{x}}{x^{\frac{1}{3}}+\sqrt{x}}\,dx$

2.) Use partial fractions to integrate the following.

a.) $\int \frac{x^2}{x^2-1}\,dx$ b.) $\int \frac{x+3}{(x-1)^2(x+2)}\,dx$

c.) $\int \frac{7-x^2}{(x^2+4)(x+4)^2}\,dx$ d.) $\int \frac{1}{x^3+1}\,dx$

3.) Write the partial fractions decomposition for each. DO NOT SOLVE FOR THE UNKNOWN CONSTANTS !

a.) $\frac{x^2+7x-5}{(7x^2+3)^2\;x^2\;(x+3)^3}$ b.) $\frac{1}{x^4+x^2+1}$

4.) Find a function $S(x)$ with the following two properties : $S'(x) = e^{x^2} + x$ and $S(3) = 5$. HINT : Use the First Fundamental Theorem of Calculus (FTC1).

5.) Assume that f is an odd function with $\int_1^3 f(x)\,dx = 7$ and $\int_{-1}^2 f(x)\,dx = 4$. Find the value of $\int_2^3 6f(x)\,dx$.

THE FOLLOWING PROBLEM IS FOR RECREATIONAL PURPOSES ONLY.

6.) A nonnegative integer I is a perfect square, triangular (PST) number if I is equal to the square of a nonnegative integer AND is also equal to one-half the product of consecutive nonnegative integers. Find the first four PST numbers.