Universidade de São Paulo
Escola Superior de Agricultura "Luiz de Queiroz"
Departamento de Ciências Exatas
LCE 0220 - Cálculo II
Professoras: Renata Alcarde Sermarini e Cristiane Mariana Rodrigues da Silva
Lista de Exercício: Integração por Substituição

Nos problemas a seguir, calcule a integral dada. Verifique se o cálculo está correto derivando o resultado.

1. Aplicando substituições convenientes, calcule as seguintes integrais:

(a) $\int \frac{a}{a-x} dx = -a\ln|a-x| + c$

(b) $\int \frac{x}{\sqrt{1+x^4}} dx = \frac{1}{2}\ln|x^2+\sqrt{x^4+1}| + c$

(c) $\int \frac{2x+3}{2x+1} dx = x + \ln|2x+1| + c$

(d) $\int \left(a+\frac{b}{x-a}\right)^2 dx = a^2x + 2ab\ln|x-a| - \frac{b^2}{x-a} + c$

(e) $\int \frac{b}{\sqrt{1-y}} dy = -2b\sqrt{1-y} + c$

(f) $\int \frac{x}{\sqrt{x^2+1}} dx = \sqrt{x^2+1} + c$

(g) $\int \frac{x^2}{1+x^6} dx = \frac{1}{3}\arctan(x^3) + c$

(h) $\int \sqrt{\frac{\arcsin x}{1-x^2}} dx = \frac{2}{3}(\arcsin(x))^{3/2} + c$

(i) $\int \frac{\arctan x/2}{4+x^2} dx = \frac{1}{4}\arctan^2\left(\frac{x}{2}\right) + c$

(j) $\int ae^{-mx} dx = -\frac{a}{m}e^{-mx} + c$

(k) $\int 4^{2-3x} dx = -\frac{4^{2-3x}}{\ln(64)} + c$

(l) $\int (e^t - e^{-t}) dt = e^t + e^{-t} + c$

(m) $\int \frac{(a^x-b^x)^2}{a^xb^x} dx = \frac{a^xb^{-x}}{\ln(a)-\ln(b)} - \frac{a^{-x}b^x}{\ln(a)-\ln(b)} - 2x + c$

(n) $\int x7^{x^2} dx = \frac{7x^2}{\ln(49)} + c$

(o) $\int \frac{e^{1/x}}{x^2} dx = -e^{1/x} + c$

(p) $\int \frac{5^{\sqrt{x}}}{\sqrt{x}} dx = \frac{2}{\ln(5)}5^{\sqrt{x}} + c$

(q) $\int \frac{e^x}{e^x-1} dx = \ln|e^x-1| + c$

(r) $\int e^x\sqrt{a-be^x}\, dx = -\frac{2}{3b}\left(a-be^x\right)^{3/2} + c$

(s) $\int \frac{\cos\sqrt{x}}{\sqrt{x}}\, dx = 2\sin(\sqrt{x}) + c$

(t) $\int \sin^2 x\, dx = \frac{1}{2}x - \frac{1}{4}\sin(2x) + c$

(u) $\int \frac{x}{\cos^2(x^2)} dx = \frac{1}{2}\tan(x^2) + c$

(v) $\int \tan^3\frac{x}{3}\sec^2\frac{x}{3} dx = \frac{3}{4}\tan^4\left(\frac{x}{3}\right) + c$

(w) $\int \frac{\sqrt{\tan x}}{\cos^2 x} dx = \frac{2}{3}\sqrt{\tan^3(x)} + c$

(x) $\int \frac{1+\sin 3x}{\cos^2 3x} dx = \frac{1}{3}\tan(3x) + \frac{1}{3}\sec(3x) + c$

(y) $\int \frac{x^3-1}{x^4-4x+1} dx = \frac{1}{4}\ln|x^4-4x+1| + c$

2. Aplicando as substituições indicadas, obtenha as integrais:

(a) $\int \frac{1}{x\sqrt{x^2-2}} dx = -\frac{1}{\sqrt{2}}\arcsin\left(\frac{\sqrt{2}}{x}\right) + c$

(b) $\int \frac{1}{e^x+1} dx = -\ln|e^x+1| + x + c$

(c) $\int \frac{x}{\sqrt{x+1}} dx = \frac{2}{3}\sqrt{x+1}\left(x-2\right) + c$

(d) $\int \frac{\cos x}{\sqrt{1+\sin^2 x}}\, dx = \ln\left|\sin(x) + \sqrt{\sin^2(x)+1}\right| + c$