Respostas - Lista 7
Funções de Uma Variável

Integral II

Exercício 1

a) $\frac{d}{dx}(\int_0^x \sqrt{1+2t}dt\,) = \sqrt{2x+1}$

b) $\frac{d}{dx}(\int_1^x \ln(t)dt) = \ln x$

c) $\frac{d}{dx}(\int_x^2 \cos(t^2)dt) = -\cos x^2$

d) $\frac{d}{dx}(\int_1^{\cos(x)} (t+\cos(t))dt) = -\frac{1}{2}\sin(x-\cos x) - \frac{1}{2}\sin 2x - \frac{1}{2}\sin(x+\cos x)$

e) $\frac{d}{dx}(\int_1^{e^x} (t+\cos(t))dt) = e^{2x} + e^x \cos(e^x)$

f) $\frac{d}{dx}(\int_{e^{x^2}}^0 \cos^2(t)dt) = -xe^{x^2}\left(\cos\left(2e^{x^2}\right)+1\right)$

h) $\frac{d}{dx}(\int_{\sqrt{x}}^{x^3} \sqrt{t}\cos(t)dt) = -\frac{1}{2\sqrt[4]{x}}\left(\cos\sqrt{x} - 6x^{\frac{9}{4}}\left(\cos x^3\right)\sqrt{x^3}\right)$

Exercício 3

a) $\int \cos(3x)dx = \frac{1}{3}\sin 3x$

c) $\int x^2\sqrt{x^3+1}dx = \sqrt{x^3+1}\left(\frac{2}{9}x^3+\frac{2}{9}\right)$

e) $\int e^{\sin(x)}\cos(x)dx = e^{\sin x}$

Exercício 4

d) $\int \frac{x}{(x^2+1)^2}dx = -\frac{1}{2(x^2+1)}$

g) $\int y^3\sqrt{2y^4-1}dy = \sqrt{2y^4-1}\left(\frac{1}{6}y^4-\frac{1}{12}\right)$

h) $\int \sqrt{4-2x}dx = -\frac{2}{3}\sqrt{2}\,(2-x)^{\frac{3}{2}}$

i) $\int \sin(\pi t)dt = -\frac{1}{\pi}\cos\pi t$

j) $\int \sec^2(2x)\tan(2x)dx = \frac{1}{2(\cos 4x+1)}$

k) $\int \frac{(\ln(x))^2}{x}dx = \frac{1}{3}\ln^3 x$

m) $\int \frac{z^3}{\sqrt[4]{1+z^4}}dx = x\frac{z^3}{\sqrt[4]{z^4+1}}$

q) $\int \frac{x}{1+x^4}dx = \frac{1}{2}\arctan x^2 - \frac{1}{4}\pi$

r) $\int xe^{-x^2}dx = -\frac{1}{2}e^{-x^2}$

Exercício 5

a) $\int x\ln(x)dx = \frac{1}{2}x^2\ln x - \frac{1}{4}x^2$

b) $\int \theta\sec^2(\theta)dx = x\frac{\theta}{\cos^2\theta}$

Exercício 6

a) $\int x \cos(5x) dx = \frac{1}{25} \cos 5x + \frac{1}{5} x \sin 5x$

b) $\int r e^{r/3} dr = 3 e^{\frac{1}{3}r} (r - 3)$

c) $\int x^2 \cos(mx) dx = \frac{1}{m^3} \left(m^2 x^2 \sin mx - 2 \sin mx + 2mx \cos mx \right)$

d) $\int \ln(2x + 1) dx = \frac{1}{2} \ln \left(x + \frac{1}{2} \right) - x + x \ln (2x + 1)$

e) $\int t^3 e^t dt = -e^t \left(-t^3 + 3t^2 - 6t + 6 \right)$

f) $\int (\ln(x))^2 dx = x \left(\ln^2 x - 2 \ln x + 2 \right)$

h) $\int_0^1 (x^2 + 1) e^{-x} dx = 3 - 6e^{-1}$

i) $\int_1^4 \sqrt{t} \ln(t) dt = 3\sqrt{t} \ln t = 3\sqrt{t} \ln t$

j) $\int_1^2 \frac{\ln(x)}{x^2} dx = \frac{1}{2} - \frac{1}{2} \ln 2$

k) $\int_0^1 x 2^x dx = \frac{1}{\ln^2 2} (2 \ln 2 - 1)$