2ª Avaliação - Cálculo II
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① a) $\int_1^2 x\,e^{-x^2+1}\,dx$

$\int x\,e^{-x^2+1}\,dx$

$\int x\,e^{-x^2+t}\cdot\frac{1}{e^{-x^2+t}(-2x)}\,dt$

$\int -\frac{1}{2}\,dt \Rightarrow -\frac{1}{2}t$

$-\frac{1}{2}e^{-x^2+1} \Rightarrow -\frac{e^{-x^2+1}}{2}\Big|_1^2$

$-\frac{e^{-2^2+1}}{2}-\left(-\frac{e^{-1^2+1}}{2}\right)$

$-\frac{e^{-3}}{2}-\left(-\frac{e^{0}}{2}\right) \Rightarrow -\frac{1}{2e^3}-\left(-\frac{1}{2}\right)$

$-\frac{1}{2e^3}+\frac{1}{2} \cong 0{,}475$

b) $\int_1^5 \sqrt{2x-1}\,dx$

$\int \sqrt{2x-1}\cdot\frac{1}{2}\,dt$

$\int \frac{1}{2}\cdot\sqrt{2x-1}\,dt \Rightarrow \int \frac{1}{2}\sqrt{t}\,dt$

$\frac{1}{2}\cdot\int\sqrt{t}\,dt \Rightarrow \frac{1}{2}\int t^{\frac{1}{2}}\,dt$

$\frac{1}{2}\cdot\frac{t^{\frac{1}{2}+1}}{\frac{1}{2}+1} \Rightarrow \frac{1}{2}\cdot\frac{t^{\frac{3}{2}}}{\frac{3}{2}}$

$\frac{1}{2}\cdot\frac{2t^{\frac{3}{2}}}{3} \Rightarrow \frac{1}{2}\cdot\frac{2\sqrt{t^3}}{3}$

$\frac{1}{2}\cdot\frac{2t\sqrt{t}}{3}$

$\frac{1}{2}\cdot\frac{2(2x-1)\sqrt{2x-1}}{3}$

$\frac{2x-1\sqrt{2x-1}}{3}\Big|_1^5$

$\frac{2\cdot5-1\sqrt{2\cdot5-1}}{3}-\frac{2\cdot1-1\sqrt{2\cdot1-1}}{3}$

$\frac{10-1\sqrt{2\cdot5-1}}{3}-\frac{1\sqrt{2-1}}{3}$

$3\sqrt{9}-\frac{1}{3} \Rightarrow 9-\frac{1}{3} \Rightarrow \frac{26}{3}$

c) $\int x^2 e^x \, dx$

$u: x^2 \quad dv: e^x$

$du: 2x\,dx \quad v: e^x$

$x^2 e^x - \int e^x \cdot 2x \, dx$

$x^2 e^x - 2\int e^x \cdot x \, dx$

$x^2 e^x - 2\left[x e^x - \int e^x \, dx\right]$

$\int u\,dv = uv - \int v\,du$

$u: x \quad dv: e^x$

$du: dx \quad v: e^x$

$x^2 e^x - 2x e^x + 2e^x + C$

d) $\int \frac{x^2+5x+4}{x^2-2x+1} \, dx$

$\int \frac{x^2}{x^2-2x+1} dx = \int \frac{5x}{x^2-2x+1} dx \int \frac{4}{x^2-2x+1}$

$\int \frac{x^2+5x+4-7x-3-(-7x-3)}{x^2-2x+1} dx$

$\int \frac{x^2+5x+4-7x-3}{x^2-2x+1} + \frac{7x+3}{x^2-2x+1} dx$

$\int 1\,dx + \int \frac{7x+3}{x^2-2x+1} dx$

$x + \int \frac{7}{x-1} + \frac{10}{(x-1)^2} dx$

$x + \int \frac{7}{x-1} dx + \int \frac{10}{(x-1)^2} dx$

$x + 7\,\mathrm{Im}(|x-1|) - \frac{10}{x-1} + C$

e) $\int x \operatorname{sen} 5x \, dx$

$u: x \qquad dv: \operatorname{sen} 5x$

$du: dx \qquad v: -\frac{1}{5}\cos 5x$

$$-\frac{x\cos 5x}{5} - \int -\frac{1}{5}\cos 5x \, dx \qquad \int u\,dv = uv - \int v\,du$$

$$-\frac{x\cos 5x}{5} + \frac{1}{5}\int \cos 5x \, dx$$

$$-\frac{x\cos 5x}{5} + \frac{1}{5}\cdot\frac{1}{5}\operatorname{sen} 5x$$

$$-\frac{x\cos 5x}{5} + \frac{1}{25}\operatorname{sen} 5x + C$$