# 1.

**Determine as seguintes integrais:**

**1)**

$$\int_0^{\sqrt{\frac{\pi}{2}}} x \sin x^2 dx$$

$$= \frac{1}{2} \int_0^{\sqrt{\frac{\pi}{2}}} 2x \sin x^2 dx$$

$$= \frac{1}{2} (-\cos x^2)\Big|_0^{\frac{\pi}{2}}$$

$$= \frac{1}{2} (-\cos (\sqrt{\frac{\pi}{2}})^2 + \cos 0)$$

$$= \frac{1}{2}$$

**2)**

$$\int_0^{\pi} (x+2) \cos x dx$$

$$f' = \cos x \qquad f = \sin x$$

$$g = x + 2 \qquad g' = 1$$

$$(x+2) \sin x\Big|_0^{\pi} - \int_0^{\pi} \sin x dx$$

$$(\pi + 2) \sin \pi - 2 \sin 0 + \cos x\Big|_0^{\pi}$$

$$= -2$$

**3)**

$$\int_1^2 x 2^x dx$$

$$f' = 2^x \qquad f = \frac{2^x}{\ln 2}$$

$$g = x \qquad g' = 1$$

$$\frac{2^x}{\ln 2} x\Big|_1^2 - \int_1^2 \frac{2^x}{\ln 2}$$

$$= \frac{8}{\ln 2} - \frac{2}{\ln 2} - \frac{1}{\ln 2} \frac{2^x}{\ln 2}\Big|_1^2$$

$$= \frac{6}{\ln 2} - \frac{2}{\ln^2 2}$$
$$= \frac{6\ln 2 - 2}{\ln^2 2}$$

### 4)

$$\int_0^1 \frac{e^x}{\sqrt{e^x+1}}dx$$
$$2(e^x+1)^{\frac{1}{2}})\Big|_0^1$$
$$2((e+1)^{\frac{1}{2}} - (2)^{\frac{1}{2}})$$

## 2.

### a)

**Calcule $\int_0^{\frac{\pi}{2}} e^x \sin(x)dx$:**

$$\int_0^{\frac{\pi}{2}} e^x sin(x)dx$$
$$f' = \sin(x) \qquad f = -\cos(x)$$
$$g = e^x \qquad g' = e^x$$
$$= \int_0^{\frac{\pi}{2}} e^x \sin(x)dx = -\cos(x)e^x\Big|_0^{\frac{\pi}{2}} - \int_0^{\frac{\pi}{2}} -\cos(x)e^x dx$$
$$f' = \cos(x) \qquad f = \sin(x)$$
$$g = e^x \qquad g' = e^x$$
$$= \int_0^{\frac{\pi}{2}} e^x \sin(x)dx = 1 + e^{\frac{\pi}{2}} - \int_0^{\frac{\pi}{2}} \sin(x)e^x dx$$
$$= \int_0^{\frac{\pi}{2}} e^x \sin(x)dx = \frac{1}{2}(1+e^{\frac{\pi}{2}})$$

## 3.

**Usando uma substituição, calcule os seguintes integrais**

**1)**

$$\int_{-1}^{1} e^{\arcsin{(x)}}dx$$

$$\sin{(x)}:[-\frac{\pi}{2},\frac{\pi}{2}]\rightarrow[-1,1]$$

$$x=\sin{(t)}\qquad dx=\cos{(t)}dt$$

$$=\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} e^{\arcsin{(\sin{(t)})}}\cos{(t)}dt$$

$$=\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} e^{t}\cos{(t)}dt$$

$$f'=\cos{(t)}\qquad f=\sin{(t)}$$

$$g=e^{t}\qquad g'=e^{t}$$

$$=\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} e^{t}\cos{(t)}dt=(\sin{(t)}e^{t})\Big|_{-\frac{\pi}{2}}^{\frac{\pi}{2}}-\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} e^{t}\sin{(t)}dt$$

$$f'=\sin{(t)}\qquad f=-\cos{(t)}$$

$$g=e^{t}\qquad g'=e^{t}$$

$$=\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} e^{t}\cos{(t)}dt=e^{\frac{\pi}{2}}-e^{\frac{-\pi}{2}}-[(-\cos{(t)}e^{t})\Big|_{-\frac{\pi}{2}}^{\frac{\pi}{2}}-\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} -e^{t}\cos{(t)}dt]$$

$$=\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} e^{t}\cos{(t)}dt=e^{\frac{\pi}{2}}-e^{\frac{-\pi}{2}}+(\cos{(t)}e^{t})\Big|_{-\frac{\pi}{2}}^{\frac{\pi}{2}}-\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} e^{t}\cos{(t)}dt$$

$$=2\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} e^{t}\cos{(t)}dt=e^{\frac{\pi}{2}}-e^{\frac{-\pi}{2}}$$

**2)**

**3)**

$$\int_{0}^{\frac{3}{2}} 2^{\sqrt{2x+1}}dx$$

$$u=\sqrt{2x+1}$$

$$\frac{1}{2}(u^2-1)=x$$

$$dx=udu$$

$$\int_{-\frac{1}{2}}^{\frac{5}{8}} 2^{u}udu$$

**4)**

$$\int_0^{\frac{\sqrt{2}}{2}} \frac{x^2}{\sqrt{1-x^2}}dx$$

$$x = \sin(t)$$

$$dx = \cos(t)dt$$

$$\arcsin(\frac{\sqrt{2}}{2}) = \arcsin(\sin(t))$$

$$t = \frac{\pi}{4}$$

$$\arcsin(0) = \arcsin(\sin(t))$$

$$t = 0$$

$$\int_0^{\frac{\pi}{4}} \frac{\sin^2(t)}{\cancel{\cos(t)}}\cancel{\cos(t)}dt$$

$$\int_0^{\frac{\pi}{4}} \frac{1-\cos(2t)}{2}dt$$

$$\int_0^{\frac{\pi}{4}} \frac{1}{2} - \frac{\cos(2t)}{2}dt$$

$$\int_0^{\frac{\pi}{4}} \frac{1}{2}dt - \frac{1}{2}\int_0^{\frac{\pi}{4}} \cos(2t)dt$$

$$\frac{1}{2}t\Big|_0^{\frac{\pi}{4}} - \frac{1}{4}\sin(2t)\Big|_0^{\frac{\pi}{4}}$$

$$\frac{1}{2}\cdot\frac{\pi}{4} - \frac{\pi}{4}\cdot\sin(\cancel{2}\cdot\frac{\pi}{\cancel{4}})$$

$$\frac{\pi-2}{8}$$