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Evaluate $\displaystyle\int_0^2 x\,\mathrm{e}^{1-x^2}\;dx$

- $\mathrm{I} = [0, 2]$ is a closed interval.

- $f(x) = x\,\mathrm{e}^{1-x^2}$ is continous on I.

- $F(x) = \displaystyle\int x\,\mathrm{e}^{1-x^2}\;dx = -\frac{1}{2}\int -2x\cdot\mathrm{e}^{1-x^2}\;dx$

$$= -\frac{1}{2}\cdot\frac{\mathrm{e}^{1-x^2}}{\ln(\mathrm{e})} + C$$

$$= -\frac{\mathrm{e}^{1-x^2}}{2} + C \qquad\qquad \because \ln(\mathrm{e}) = 1$$

**Remember that,** $\displaystyle\int f' a^f\;dx = \frac{a^f}{\ln(a)} + C$

Then, by using Fundamental theorem of Calculus

$$\int_0^2 x\,\mathrm{e}^{1-x^2}\;dx = \left[-\frac{\mathrm{e}^{1-x^2}}{2}\right]_0^2 = -\frac{\mathrm{e}^{1-4}}{2} - \left(-\frac{\mathrm{e}^{1}}{2}\right)$$

$$= \frac{\mathrm{e}}{2} - \frac{\mathrm{e}^{-3}}{2}$$