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Lista 2

4) a) Método da Importância

$$I = \int_0^1 (1-x^5)^{7/2}\,dx \qquad f(x) = (1-x^5)^{7/2} \qquad g(x) = Ax^{7/2}$$

$$\int_0^1 Ax^{7/2}\,dx = 1 \rightarrow A\int_0^1 x^{7/2}\,dx = 1 \rightarrow A\left[\frac{2}{9}x^{9/2}\Big|_0^1\right] = 1 \rightarrow A\left[\frac{2}{9} * 1^{9/2}\right] = 1$$

$$A\frac{2}{9} = 1 \therefore A = \frac{9}{2}$$

$$g(x) = A\int_0^x x^{7/2}\,dx = x^{9/2} = u \qquad x = u^{2/9}$$

$$E_g\left[\frac{f(x)}{g(x)}\right] = \frac{(1-x^5)^{7/2}}{\frac{9}{2}x^{7/2}}$$

b) Método da Importância

$$I = \int_{-5}^{10} e^{(x+x^3)}\,dx \qquad f(x) = e^{(x+x^3)} \qquad g(x) = Ae^{x+1}$$

$$\int_{-5}^{10} Ae^{x+1}\,dx = 1 \rightarrow A\int_{-5}^{10} e^{x+1}\,dx = 1 \text{ logo, } A = \frac{1}{e^{11} - e^{-4}}$$

$$\int_{-5}^{x} Ae^{x+1}\,dx = u \text{ , logo } x = \ln\left(e^{-5} + \frac{u}{A}\right)$$

$$E_g\left[\frac{f(x)}{g(x)}\right] = \frac{e^{(x+x^3)}}{Ae^{x+1}}$$

c) Método da Importância

$$I = \int_0^\infty x^2(1+x^2)^{-3}\,dx \qquad I = \int_0^\infty f(x)\,dx \qquad y = \frac{1}{(1+x)}$$

$$dx = \frac{-dx}{(1+x)^2} = -y^2\,dx \qquad I = \int_0^1 \frac{f\left(\frac{1}{y}-1\right)}{y^2}\,dy$$

$$\int_0^1 \frac{\left(\frac{1}{y}-1\right)^2\left(1+\left(\frac{1}{y}-1\right)^2\right)^{-3}}{y^2}\,dy \qquad g(x) = Ay^2$$

$$A\int_0^1 y^2\,dx = 1 \rightarrow A\left[\frac{x^3}{3}\Big|_0^1\right] = 1 \rightarrow A\frac{1}{3} = 1 \rightarrow A = 3$$

$$\int_0^x Ay^2\,dx = u \rightarrow x = \left(\frac{3u}{A}\right)^{1/3}$$