CS-PROBLEM 15

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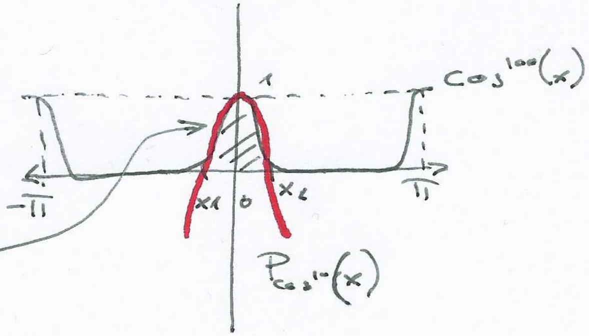
Idea: Compute Taylor series to approximate $\cos^{100}(x)$ around $x = 0$. Then calculate the area under a "peak" (by integrating Taylor polyn.) to estimate $\int_{-\pi}^{\pi} \cos^{100}(x)\,dx$.



- Taylor series for $n = 6$

$$P_{\cos^{100}}(x) = 1 - 50x^2 + \frac{3755}{3}x^4 - \frac{183770}{9}x^6$$

- Compute Integral between x_1 and x_2 (When $P_{\cos^{100}}(x_1) = P_{\cos^{100}}(x_2) = 0$)

$$\int_{x_1}^{x} P_{\cos^{100}}(x)\,dx = \underline{0.2237}$$

$$\Rightarrow \int_{-\pi}^{\pi} \cos^{100}(x)\,dx \approx 2 \cdot 0{,}2237 = \underline{\underline{0{,}447}}$$

since there are two peaks in $I = [-\pi, \pi]$

- Compute the mean of $\cos^{100}(x)$ (or. $\sin^{100}(x)$) (or expectation value)

$$E(x) = \frac{0.447}{2\pi} = \underline{\underline{0{,}0711}}$$