1 7.5: Average Value of a Function

Goal: To find the average value of a function \( f \) on a given interval \([a, b]\).

Average of \( n \) values:

Derivation of formula for average value of a function:

Geometric Interpretation:

Examples: At time \( t \) (in days), a lump of Thorium contains \( M = 200e^{-t/40} \) kg of radioactive Thorium-234. Find the average amount of Thorium-234 present in the first 40 days.
The electric current in a household power supply is an alternating current modeled by $i(t) = I \sin \omega t$.

a) Show that the average value of $i$ over one period is 0.

b) The **root mean square** (rms) current is the square root of the average value of $i^2$ over one period. Calculate the rms current.

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**On Beyond Average:**

The graph of a function $f$ on the interval $0 \leq x \leq 1$ is shown below. If possible, determine whether $f_{\text{avg}} = \frac{3}{2}$, $f_{\text{avg}} < \frac{3}{2}$, or $f_{\text{avg}} > \frac{3}{2}$. Clearly explain your reasoning.