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:** Find the average value of $f(x) = \sqrt{x}$ from $x = 0$ to $x = 4$.

Find value(s) $c \in [0, 4]$ such that $f(c) = f_{avg}$. Is it always possible to find such a value?

The normal temperature on a certain day in College Station is modelled by $T(t) = 80 + 10 \sin \left( \frac{\pi}{12} t \right)$, where $t$ is the number of hours since 9am. Find the average temperature from 9am to noon.
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.

On Beyond Average:

b) The \textbf{root mean square} (rms) current is the square root of the average value of \( i^2 \) over one period. Using the equation in the previous example, calculate the rms current.

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