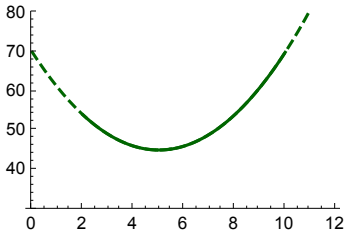
6.5 Average Value of a Function

Example 1 The temperature from 2AM in the morning until 10AM is given by the function $T(t) = t^2 - 10t + 70$. Find the average temperature on this interval.



Average value of a function

If f is a continuous function on the interval $[a, b]$ the **average value of the function** on $[a, b]$ is given by

$$f_{ave} = \frac{1}{b-a}\int_a^b f(x)\,dx$$

Example 2 Find the average value of the function $f(x) = 4e^{0.5x}$ on the interval [0, 5]

Example 3 For the function $f(x) = \frac{1}{x}$ find a value c in the interval [1, 10] such that $f(c) = f_{ave}$.

Mean Value Theorem

If f is a continuous function on the interval $[a, b]$, then there exists a c on the interval $[a, b]$ such that $f(c) = f_{ave}$.

Example 4 Find all the value(s) c that satisfies the mean value theorem for $f(x) = \sin(x)$ on the interval $[0, \pi]$.

Example 5 Show that a function will have a maximum or minimum average value on the interval $[a, b]$ when $f(a) = f_{ave}$ or $f(b) = f_{ave}$.