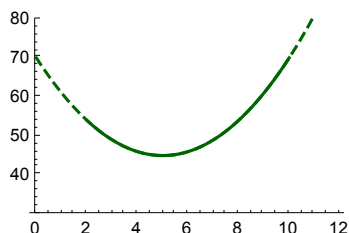


## 6.5 Average Value of a Function

**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

▽

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

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

**Example 3** Find a value  $c$  on  $[a, b]$  such that  $f(c) = f_{\text{ave}}$ .

## 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  $f(c) = f_{\text{ave}}$ .

**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** Consider the function  $f(x) = x^2 - 4x + 5$ . Find the value  $a$  such that  $f_{\text{ave}}$  has a minimum value on the interval  $[a, 4]$ , and calculate  $f(a)$  and  $f_{\text{ave}}$  on  $[a, 4]$ . May require *Mathematica*.