

- If  $F(x)$  is an **antiderivative** of  $f(x)$ , then

$$\int_a^b f(x) dx = F(b) - F(a).$$

- The integral  $\int_a^b f(x) dx$  equals the **signed area** between the graph of  $f(x)$  and the  $x$ -axis.
- If  $f(x)$  is **monotonic** on  $[a, b]$  and if  $\int_a^b f(x) dx$  is approximated by a Riemann sum with subintervals of width  $\Delta x$ , then the **error** in the approximation is at most  $\Delta x \cdot |f(b) - f(a)|$ .

### Self-Testing

- You should be able to write down (by hand) a Riemann sum to approximate a quantity expressed as a product (e.g., human effort, electrical energy, work, distance travelled, area).
- You should be able to write down an integral giving the *exact* value of a quantity approximated by a Riemann sum.
- You should be able to use **sigma notation** to abbreviate a sum, and you should be able to read sigma notation to calculate a sum.
- You should be able to use a computer program to compute the value of a Riemann sum.
- You should be able to find an error bound when approximating an integral by a Riemann sum.
- You should know and be able to use the **integration rules**.
- You should be able to use the fundamental theorem of calculus to find the value of an integral.
- You should be able to use an antiderivative to find the value of an integral.