

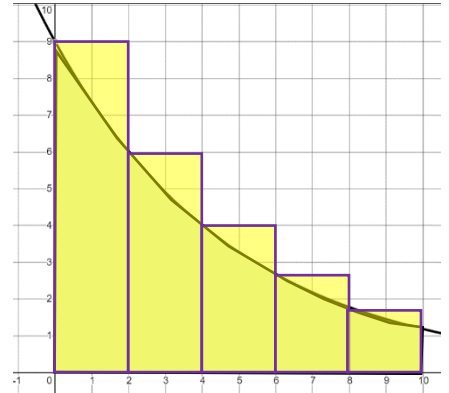
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Definite Integrals

Riemann Sums – area under curve found by summing up the area of rectangles

Area $\approx \sum$ area of rectangles

Sample of a graph of $f(x)$



What if the # of rectangles was infinite?

<https://animated-mathematics.net/riemann-sums.html>

$$\text{Area} = \sum_{k=1}^n f(c_k) \Delta x_k$$

$$\sum_{k=1}^n f(c_k) \Delta x_k$$

Definition of the Definite Integral

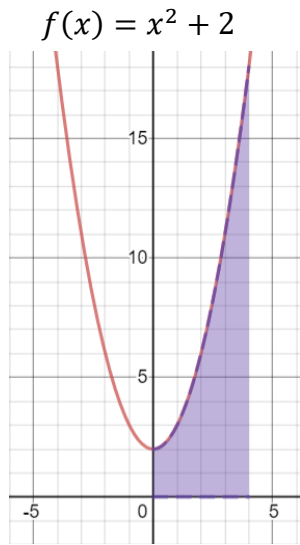
If f is defined on $[a, b]$ and $\lim_{\Delta x \rightarrow 0} \sum_{k=1}^n f(c_k) \Delta x_k$ exists,

then f is integrable on $[a, b]$ and

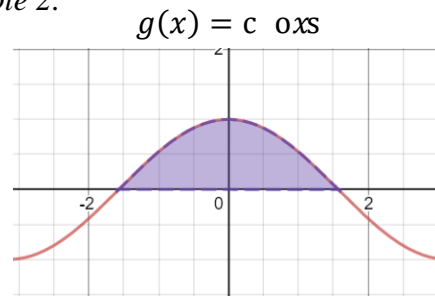
$$\lim_{\Delta x \rightarrow 0} \sum_{k=1}^n f(c_k) \Delta x_k =$$

Set up a definite integral that yields the area of the shaded region.

Example 1:



Example 2:



Evaluate the integral (using knowledge of geometric shapes)

Example 1: $\int_3^7 4 \, dx$

Example 2: $\int_1^3 (-2x + 4) \, dx$

- Evaluate the integral (using knowledge of geometric shapes)

Example 3: $\int_0^4 \sqrt{16 - x^2} \, dx$

Example 4: $\int_{-1}^1 (1 - |x|) \, dx$

Example 5: $\int_3^7 (1 + \sqrt{9 - x^2}) \, dx$