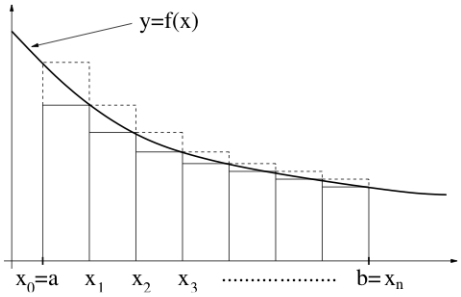
Name:

5.2 Definite Integral

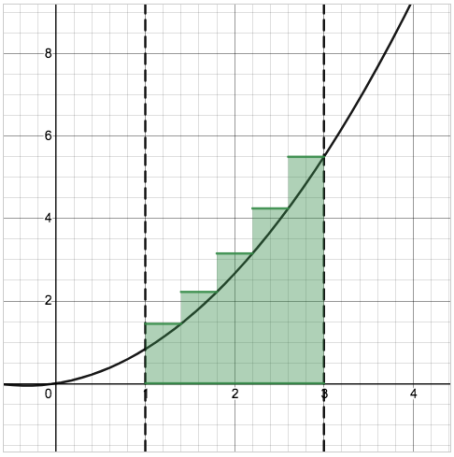
Definition The *definite integral* of $f(x)$ from a to b is the limit of the left and right hand sums as the number of rectangles approaches infinity. We write:

n = number of rectangles

Δx = width of one rectangle



1. Consider the rectangular approximation of $\int_1^3 \left(0.5x^2 + \frac{x}{3}\right) dx$ shown on the graph.

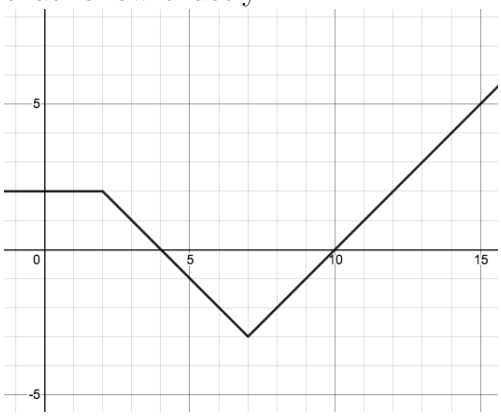


   (a) Is this a right or left rectangular approximation?

   (b) Is it an under or over approximation of the integral?

   (c) Write an expression for the right rectangular approximation using summation notation.

2. Let f be the graph of the function shown to below. Calculate each of the integrals that follow exactly.



(a) $\int_0^1 f(x)\,dx =$

(b) $\int_0^2 f(x)\,dx =$

(c) $\int_0^4 f(x)\,dx =$

(d) $\int_4^7 f(x)\,dx =$

(e) $\int_0^1 5f(x)\,dx =$

(f) $\int_7^1 3f(x)\,dx =$

3. Let g be the function defined on $0 \leq t \leq 20$, some of whose values are shown in the table below.

t	0	5	10	15	20
$g(t)$	30	20	8	0	-2

(a) Estimate the value of $\int_0^{12} f(x)\,dx$ using left rectangular sums.

(b) Is your estimate an over or under estimate? Why?

(c) Find a more accurate estimate of the integral. Why is it more accurate?