# Arbeidshefte

# Rektangelsum

La $f$ være en funksjon i intervallet $[a, b]$, og $P = (x_0, x_1, .., x_n)$ være en oppdeling av intervallet som er slik at

$$a = x_0 < x_1 < x_2 < ... < x_{n-1} < x_n = b$$

En Riemannsum S av f over [a,b] med partisjonen P er da definert som

$$S = \sum_{i=1}^{n} f(x_i)\Delta x_i$$

der

$$\Delta x_i = x_i - x_{i-1}$$

$\Delta x = \frac{b-a}{n}$, da blir $x$-verdiene : $\{a, a + \Delta x, a + 2\Delta x, a + 3\Delta x, ..., a + (n-1)\Delta x, a + n\Delta x = b, \}$

Riemannsum - venstre

$$S_v = \Delta x(f(a) + f(a + \Delta x) + f(a + 2\Delta x) + ... + f(b - \Delta x))$$

Riemannsum - høyre

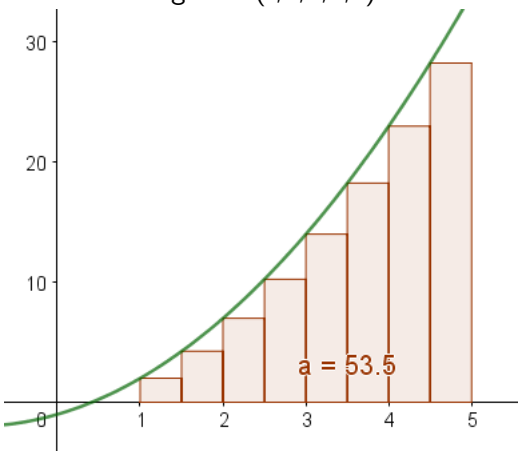
$$S_h = \Delta x(f(a + \Delta x) + f(a + 2\Delta x) + ... + f(b - \Delta x), f(b))$$

Riemannsum - midtpunkt

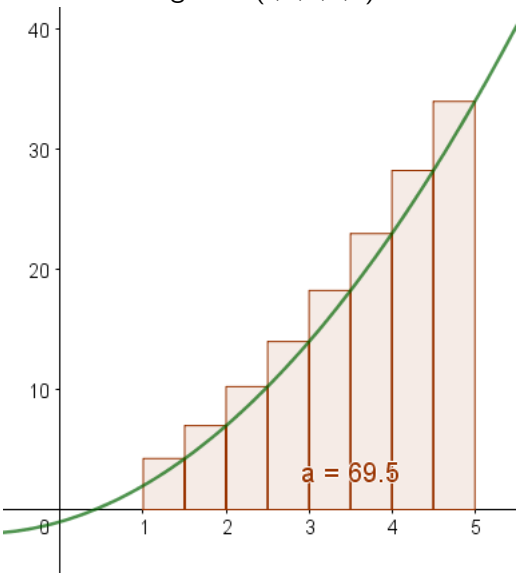
$$S_m = \Delta x(f(a + \frac{\Delta x}{2}) + f(a + \frac{3\Delta x}{2}) + ... + f(b - \frac{\Delta x}{2}))$$

$$f(x) = x^2 + 2x - 1$$

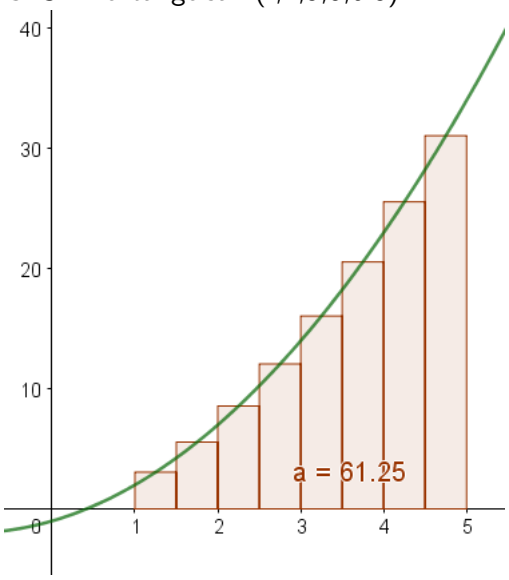
CAS : Rektangelsum(f,1,5,8,0)

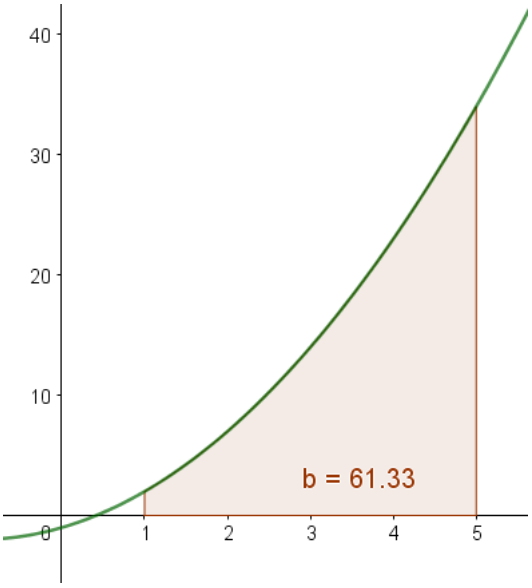



CAS : Rektangelsum(f,1,5,8,1)




CAS : Rektangelsum(f,1,5,8,0.5)



**Program**

```
1  import numpy as np
2  def f(x):
3      return x**2+2*x-1
4
5  xStart = 1
6  xStop = 5
7  dx = 0.5
8  n = int((xStop-xStart)/dx)
9  xVerdier = np.linspace(xStart,xStop,n+1)
10
11 sum = 0
12 print(xVerdier[:-1])
13
14 for i in xVerdier[:-1]:
15     sum += f(i)*dx
16 print(sum)
17
18 sum = 0
19 print(xVerdier[1:])
20
21 for i in xVerdier[1:]:
22     sum += f(i)*dx
23 print(sum)
24
25 sum = 0
26 print(xVerdier[:-1]+dx/2)
27
28 for i in xVerdier[:-1]:
29     sum += f(i+dx/2)*dx
30 print(sum)
```

**Output**

```
[ 1.  1.5  2.  2.5  3.  3.5  4.  4.5 ]
53.5
[ 1.5 2. 2.5 3. 3.5 4. 4.5 5. ]
69.5
[ 1.25 1.75 2.25 2.75 3.25 3.75 4.25 4.75 ]
61.25
>>>
```