

# Math 262-Calculus II Maple Project

## Midpoint Rule, Trapezoidal Rule, Simpson's Rule

with(Student[Calculus1]) :

### Defining the function f(x).

$$f := 2 \cdot x^2 - \frac{x^3}{3}$$

$$2x^2 - \frac{1}{3}x^3 \quad (1)$$

### Integration of the function from x = 1 to x = 5.

A := int(f, x = 1 .. 5);

$$\frac{92}{3} \quad (2)$$

### Trapezoidal Rule Graph with 4 partitions.

ApproximateInt(f, x = 1 .. 5, method = trapezoid, output = plot, partition = 4);

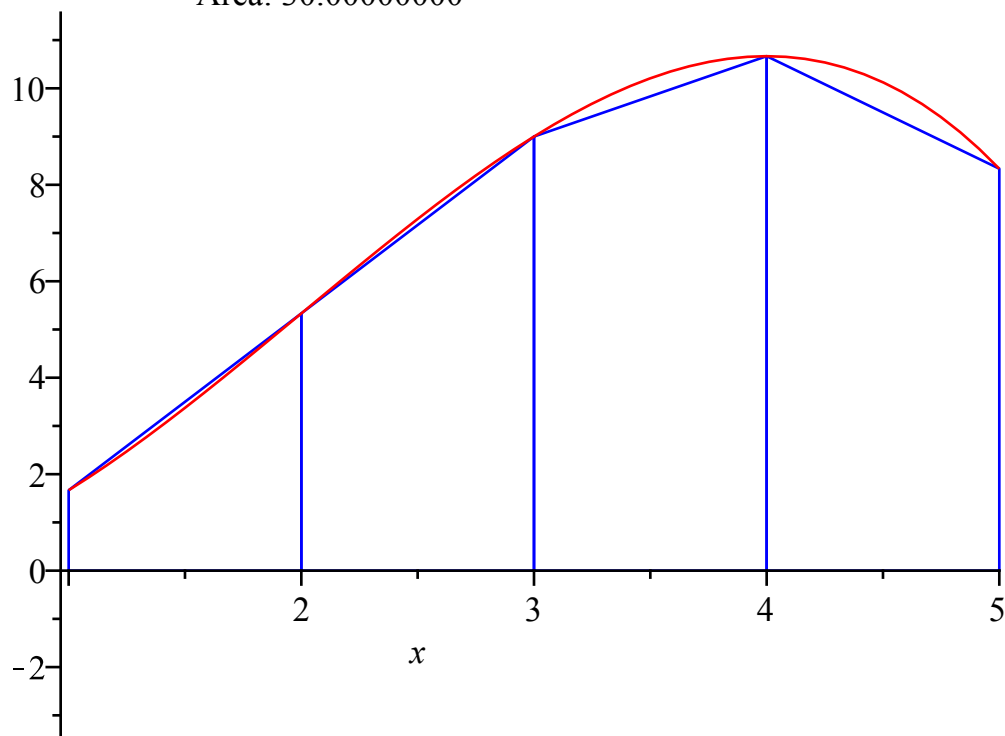
An Approximation of the Integral of

$$f(x) = 2x^2 - \frac{1}{3}x^3$$

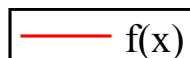
on the Interval [1, 5]

Using the Trapezoid Rule

Area: 30.00000000



Partitions: 4



## Summation of f(x) from x = 1 to x = 5 with 4 partitions using the Trapezoidal Rule.

*with(student) :*  
*trapezoid(f, x = 1 ..5, 4);*

$$5 + \sum_{i=1}^3 \left( 2(1+i)^2 - \frac{1}{3}(1+i)^3 \right) \quad (3)$$

## Value of the Riemann Sum of f(x) from x = 1 to x = 5 with 4 partitions using the Trapezoidal Rule.

*T := evalf(trapezoid(f, x = 1 ..5, 4));*  
30.00000000 (4)

## Error.

*abs(A - T);*  
0.66666667 (5)

## Midpoint Rule Graph with 4 partitions.

*ApproximateInt(f, x = 1 ..5, method = midpoint, output = plot, partition = 4);*

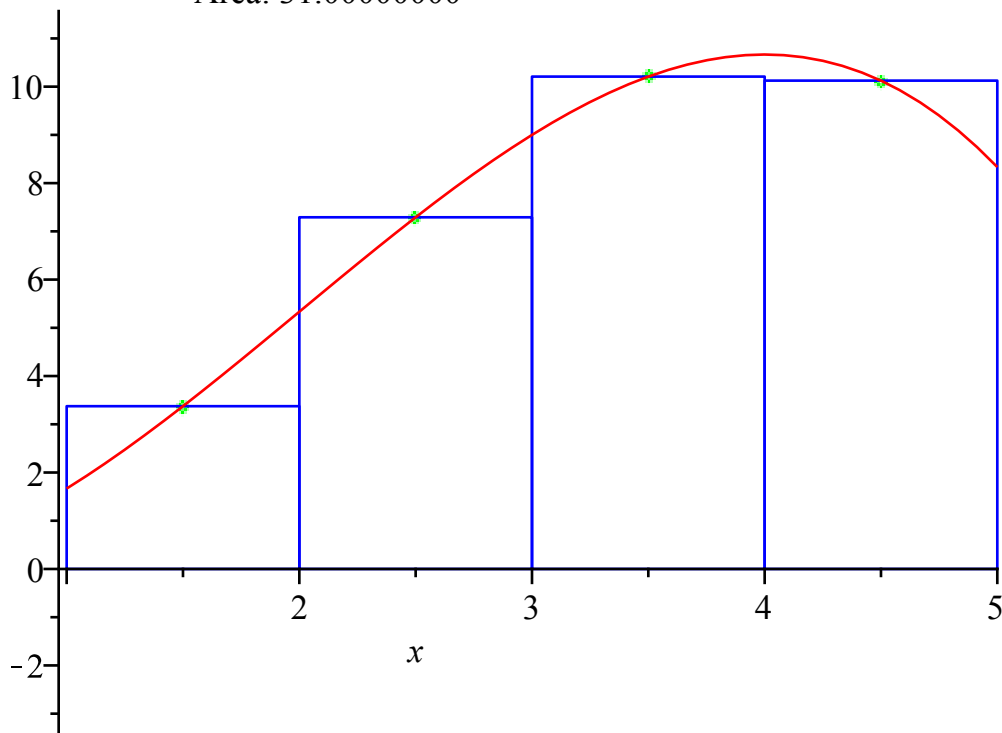
An Approximation of the Integral of

$$f(x) = 2x^2 - \frac{1}{3}x^3$$

on the Interval [1, 5]

Using a Midpoint Riemann Sum

Area: 31.00000000



Partitions: 4

— f(x)

**Value of the Riemman Sum of f(x) from x=1 to x=5 with 4 partitions using the Midpoint Rule.**

*M := RiemannSum(f, x = 1 ..5, method = midpoint, partition = 4);*

31

(6)

**Error.**

*abs(M - A);*

$\frac{1}{3}$

(7)

**Simpson's Rule Graph with 4 partitions.**

*ApproximateInt(f, x = 1 ..5, method = simpson, output = plot, partition = 4);*

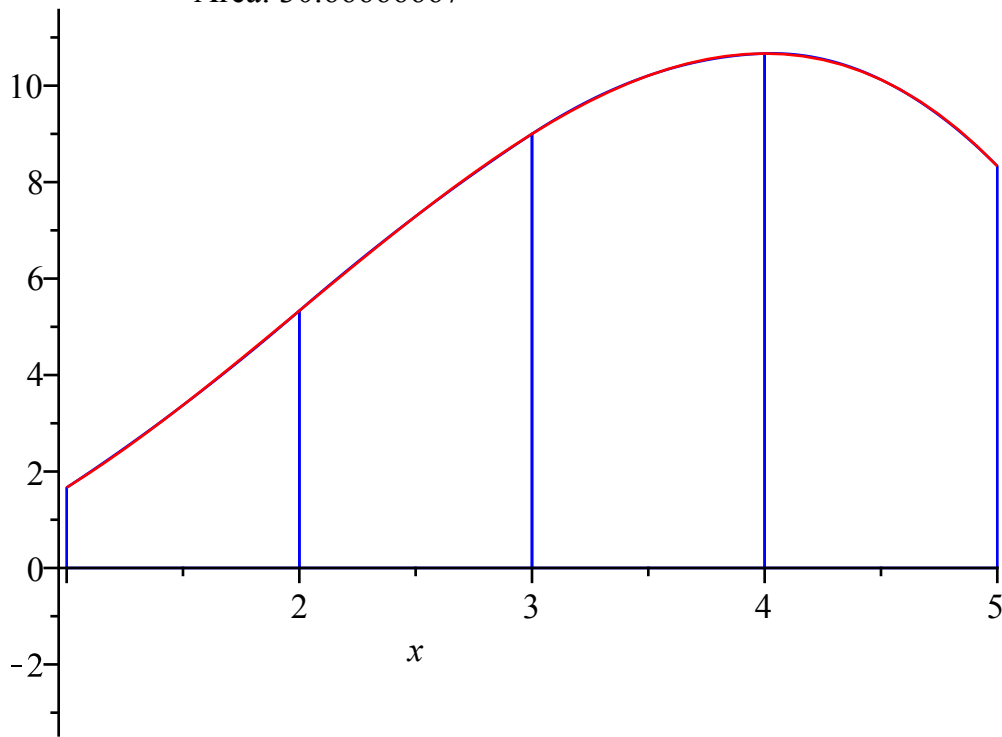
An Approximation of the Integral of

$$f(x) = 2*x^2 - 1/3*x^3$$

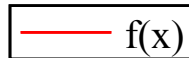
on the Interval [1, 5]

Using Simpson's Rule

Area: 30.66666667



Partitions: 4



**Value of the Riemman Sum of f(x) from x=1 to x=5 with 4 partitions using Simpson's Rule.**

*simpson(f, x = 1 ..5, 4);*

$$\frac{10}{3} + \frac{4}{3} \sum_{i=1}^2 \left( 8i^2 - \frac{8}{3}i^3 \right) + \frac{2}{3} \sum_{i=1}^1 \left( 2(1+2i)^2 - \frac{1}{3}(1+2i)^3 \right) \quad (8)$$

**Value of the Riemann Sum of f(x) from x = 1 to x = 5 with 4 partitions using Simpson's Rule.**

$S := \text{evalf}(\text{simpson}(f, x=1..5));$

30.66666666 (9)

**Error.**

$\text{abs}(S - A);$

$1.10^{-8}$  (10)