Object-oriented Modelling and Programming in Engineering

Homework 1

- **Integration by Hand: (Exact result of the integration) – Task 3.2**

E(t) = $\int_0^t p(t)\, dt$

P(t) = a1*t + sin(2*π*f1*t)

a1 = $\frac{(My\ Registration\ Number)}{40000}$ **W =** $\frac{119483}{40000}$ **= 3.1141 W**

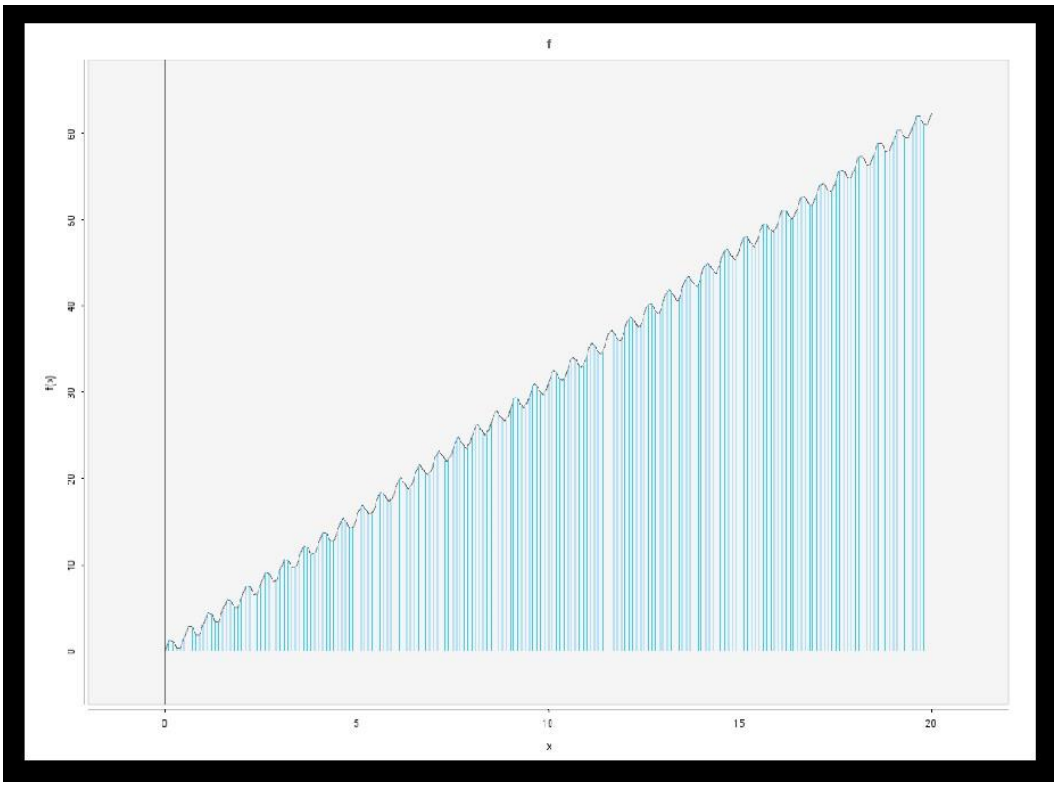
f1 = 2 Hz, t = 20s

$\int_0^t p(t) = \int_0^{20} a1 * t + sin\,(2 * \pi * 2 * t)$

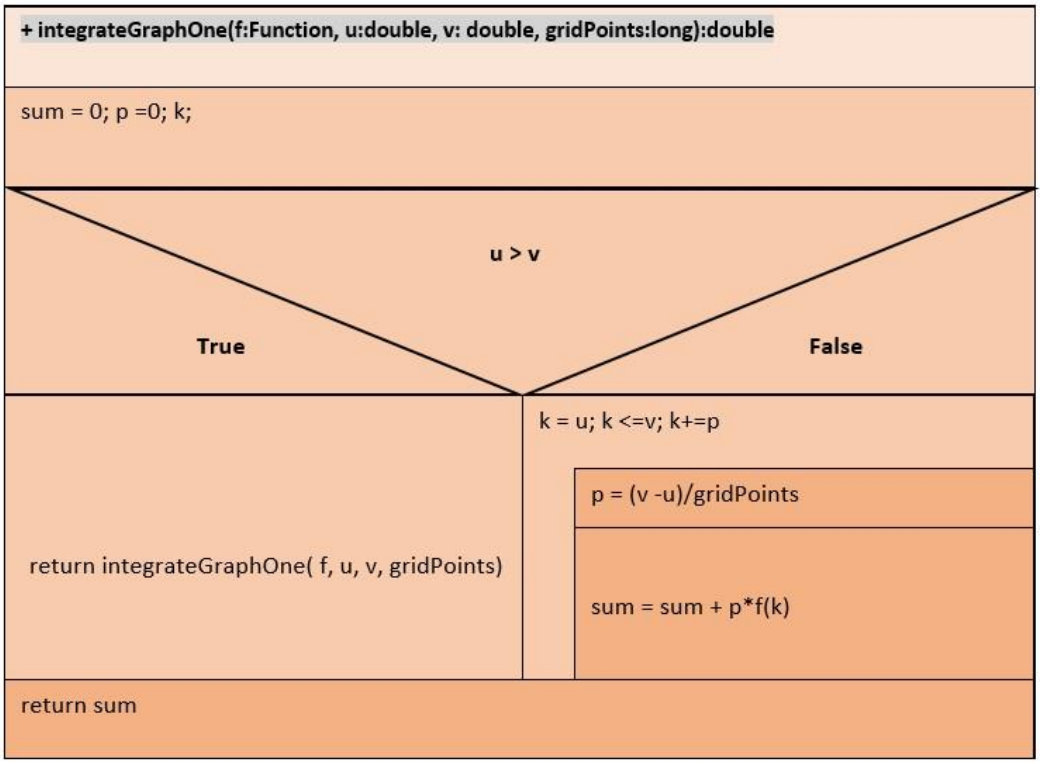
= [a1* $\frac{(20)^2}{2}$ **+ (- cos (4*π** $* 20)$**)]**

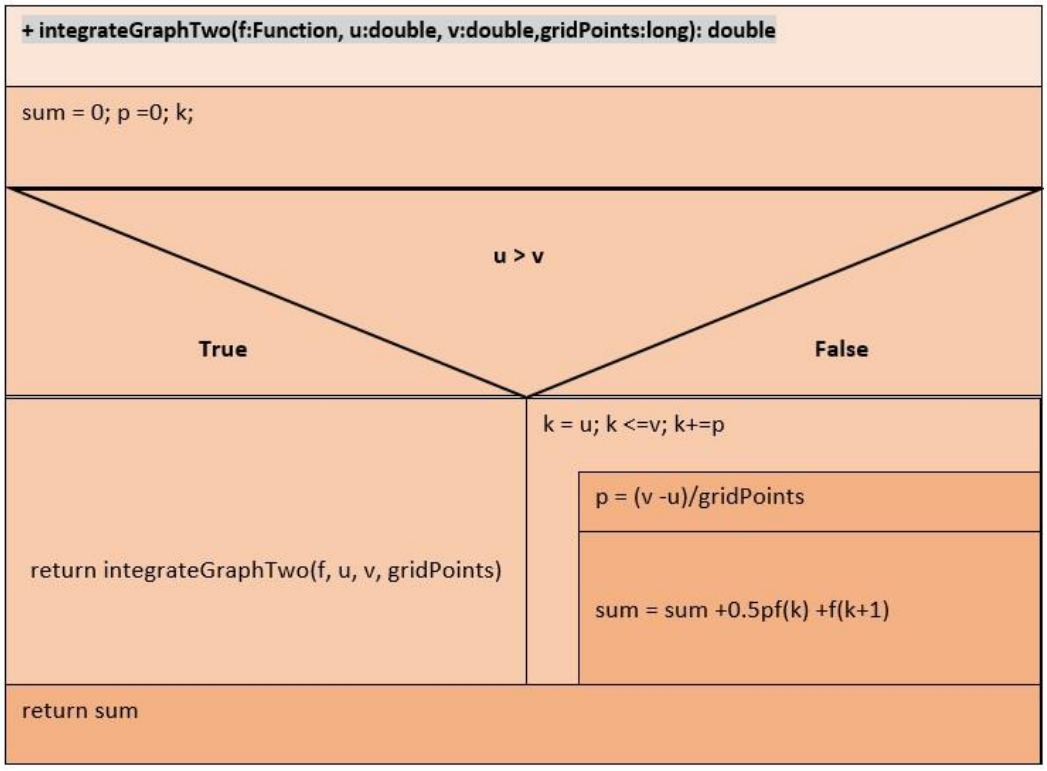
=628.520

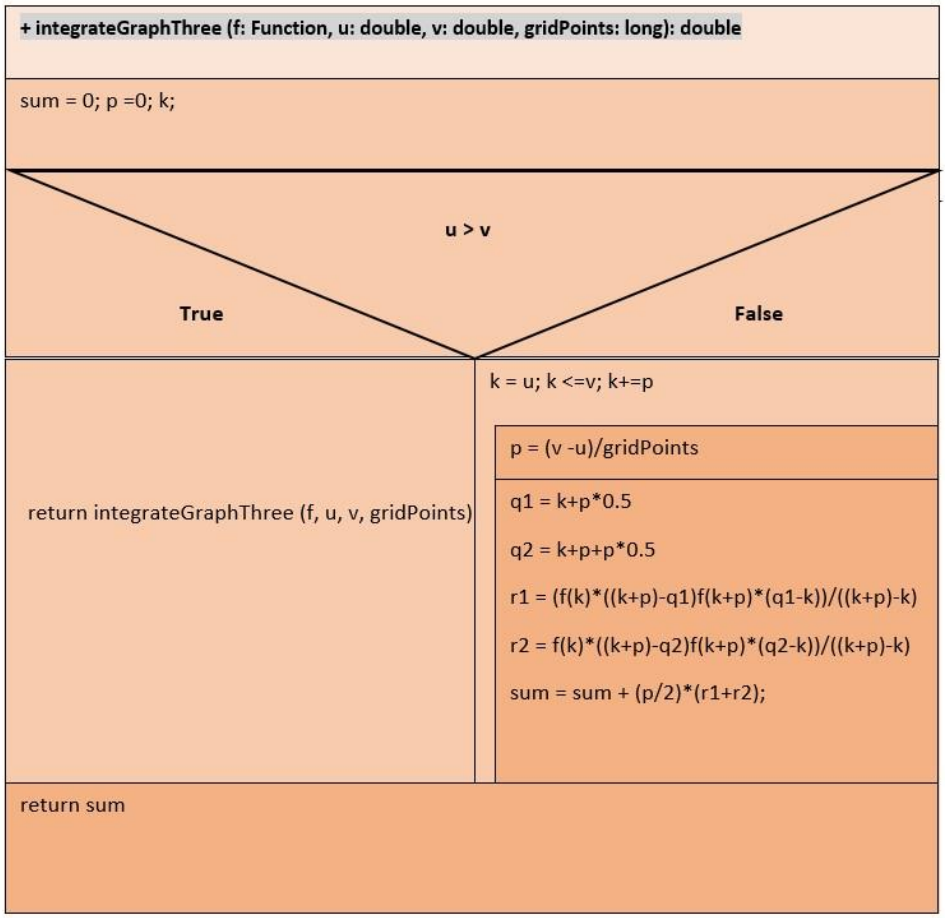
- **Plot of the function P(t) – Task 3.1**



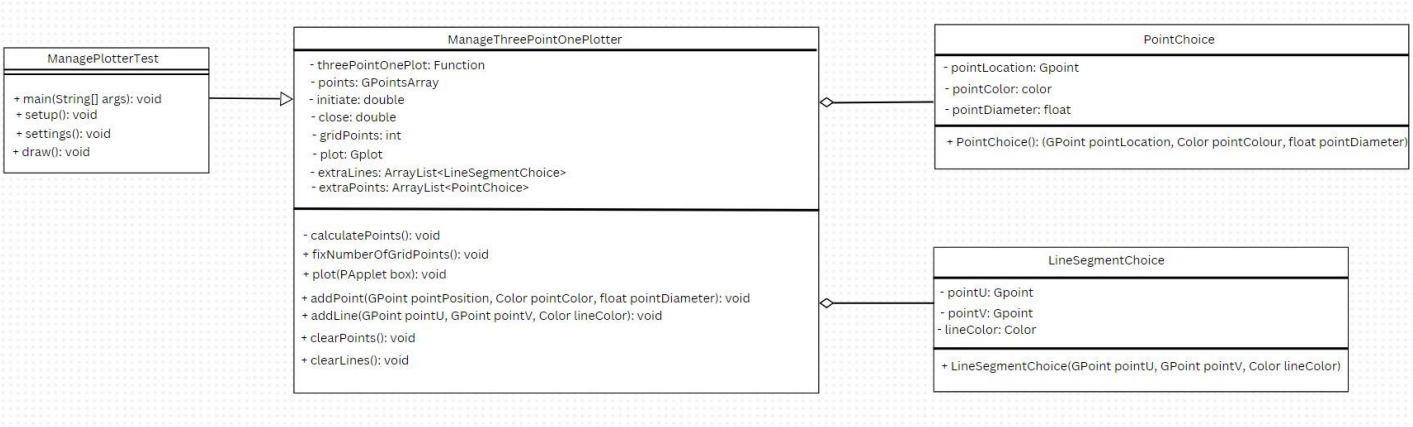
- **Nassi-Schneiderman diagrams for all algorithms – Task 3.3**

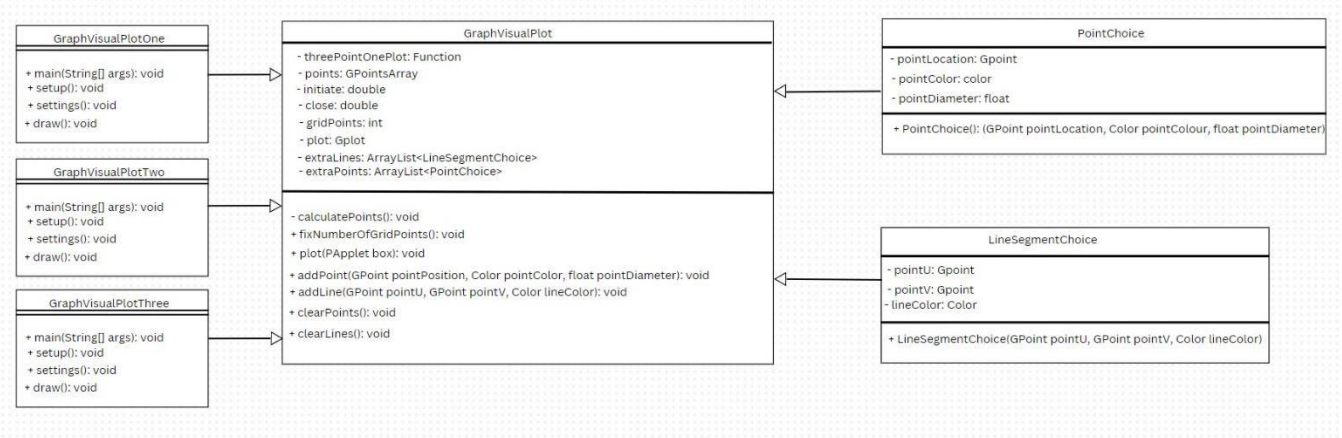


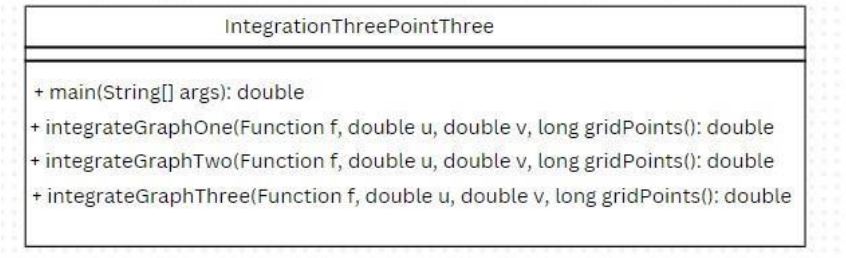

+ integrateGraphTwo(f:Function, u:double, v:double,gridPoints:long): double
sum = 0; p =0; k;
u > v
True
False
return integrateGraphTwo(f, u, v, gridPoints)
k = u; k <=v; k+=p
p = (v -u)/gridPoints
sum = sum +0.5pf(k) +f(k+1)
return sum


+ integrateGraphThree (f: Function, u: double, v: double, gridPoints: long): double
sum = 0; p =0; k;
u > v
True
False
return integrateGraphThree (f, u, v, gridPoints)
k = u; k <=v; k+=p
p = (v -u)/gridPoints
q1 = k+p*0.5
q2 = k+p+p*0.5
r1 = (f(k)*((k+p)-q1)f(k+p)*(q1-k))/((k+p)-k)
r2 = f(k)*((k+p)-q2)f(k+p)*(q2-k))/((k+p)-k)
sum = sum + (p/2)*(r1+r2);
return sum

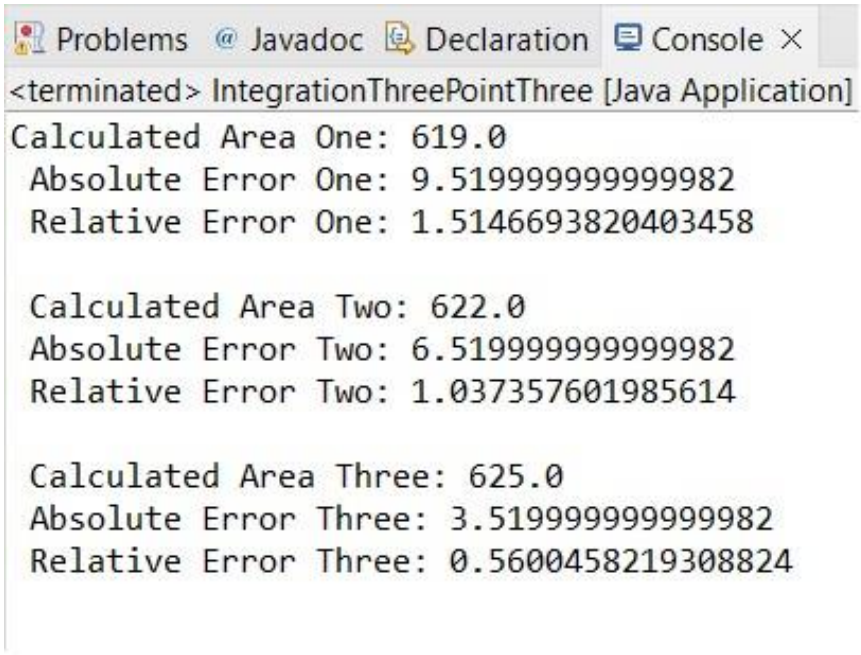
- **UML-diagram(s) for the software structure**



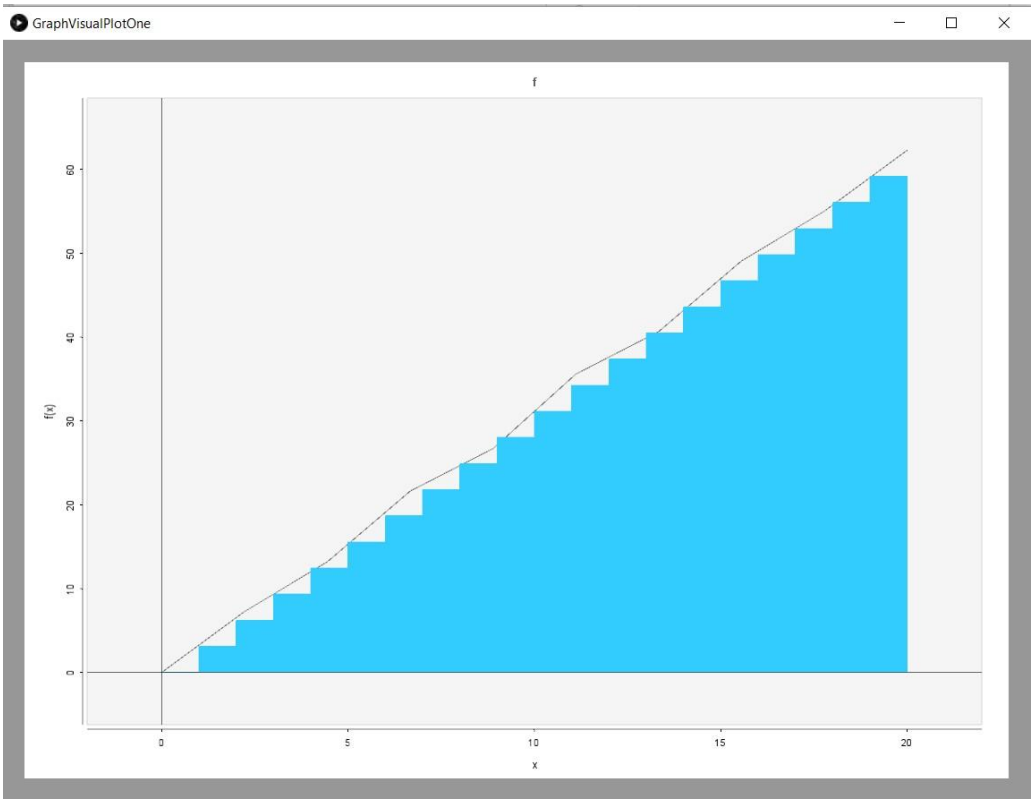


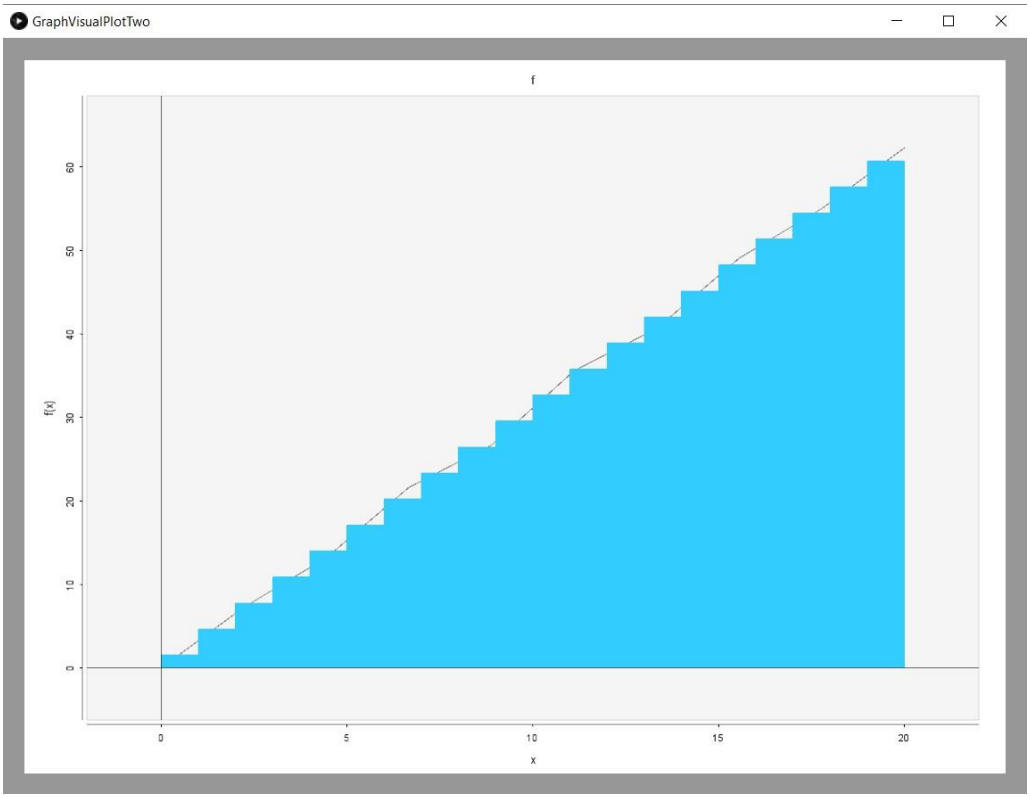


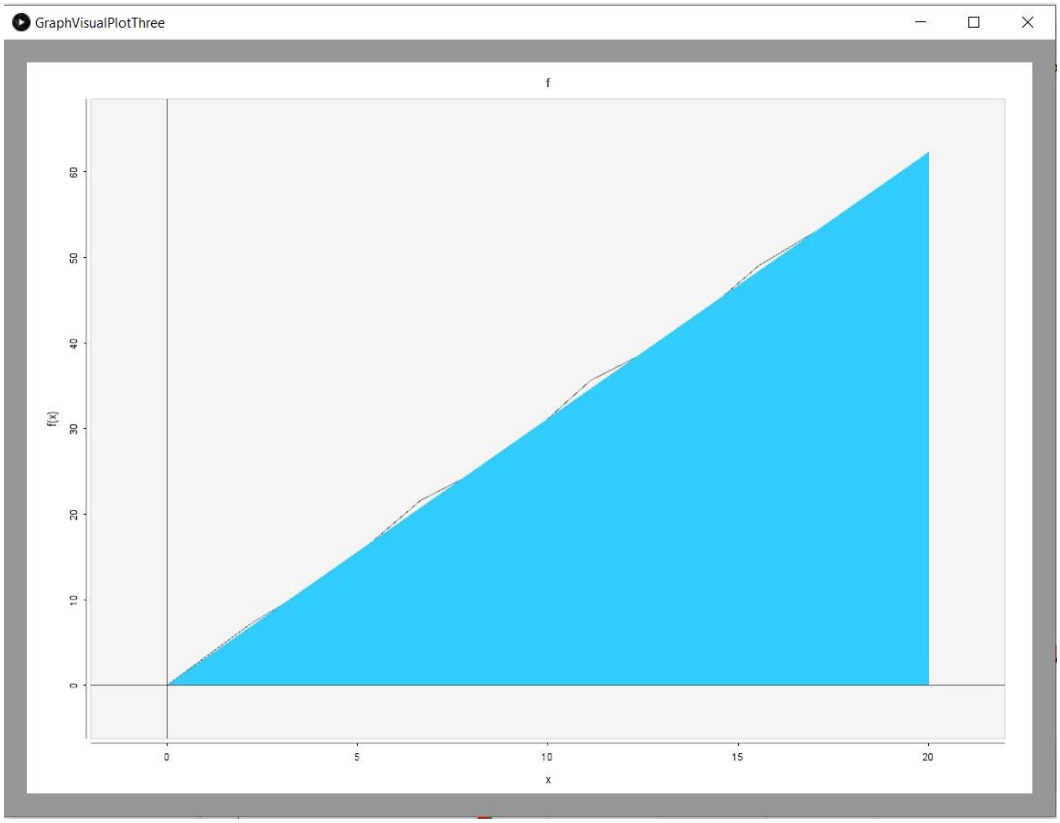
- **Result of Numerical Integration and Absolute and Relative Errors:**



- **Visualization of the integral according to figure 1, 2, and 3 (blue area)**


GraphVisualPlotOne
f
f(x)
x
0
10
20
30
40
50
60
0
5
10
15
20


GraphVisualPlotTwo
f
f(x)
x
0
10
20
30
40
50
60
0
5
10
15
20


GraphVisualPlotThree
f
f(x)
0
10
20
30
40
50
60
0
5
10
15
20
x