

Example(8): Find the approximation value of the integral by using Romberg integration method

$$\int_0^2 x^2 dx, \quad n=4$$

```
% Romberg Method
clear;clc;
syms x
f=x^2;
n=input('n=');
a=input('a=');
b=input('b=');
R=zeros(n);
R(1,1)=(b-a)/2*(subs(f,a)+subs(f,b));
for k=2:n
    h=(b-a)/(2^(k-2));
    s=0;
    for i=1:2^(k-2)
        s=s+subs(f,a+(i-1/2)*h);
    end
    R(k,1)=(R(k-1,1)+h*s)/2;
    for i=2:n
        if i>k
            continue
        end
        R(k,i)=(4^(i-1)*R(k,i-1)-R(k-1,i-1))/(
            4^(i-1)-1);
    end
end
R
```

```
n=4
a=0
b=2
R =
    4.0000     0         0         0
    3.0000    2.6667     0         0
    2.7500    2.6667    2.6667     0
    2.6875    2.6667    2.6667    2.6667
```