数值分析实践报告(八)

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- 一、实验项目名称: 数值积分
- 二、实验目的:熟悉并掌握复合辛普森法、Romberg 法求数值积分
- 三、实验内容:八_1、P154 练习 8.4---对不同的n=10,20进行实验;八_2、P162 练习 8.11---三个积分都做,按照表 8.3 写报告。

```
%练习 8.11 (1)
四、程序设计
                                                interval=[-1,1];
% 练习 8.4 n=10 时
                                                a=interval(1);b=interval(2);
sn1=0;
                                                h=b-a;
sn2=0;
                                                syms x
x1=0.1:0.1:0.9;
                                                y=sin(x)/x;
x2=0.05:0.1:0.95;
                                                Told=eval(subs(y,x,a))+eval(subs(y,x,b));
for i=1:9
                                                Sold=NaN;Cold=NaN;Rold=NaN;
   sn1=sn1+sin(x1(i))/x1(i);
                                                A=[0,Told,Sold,Cold,Rold];
end
                                                Tnew=0.5*Told+0.5*h*1;
for j=1:10
                                                Snew=(4*Tnew-Told)/3;
   sn2=sn2+sin(x2(j))/x2(j);
                                                Cnew=(16*Snew-Sold)/15;
end
                                                Rnew=(64*Cnew-Cold)/63;
sn=(1+sin(1)/1+4*sn2+2*sn1)/60
                                                A=[A;1,Tnew,Snew,Cnew,Rnew];
%练习 8.4 n=20 时
                                                h=h/2;
sn1=0;
                                                for i=2:10
sn2=0;
                                                    intervalx=a+h/2:h:b-h/2;
x1=0.05:0.05:0.95;
                                                    sumy=0;
x2=0.025:0.05:0.975;
                                                    for j=1:length(intervalx)
for i=1:length(x1)
   sn1=sn1+sin(x1(i))/x1(i);
                                                sumy=sumy+eval(subs(y,x,intervalx(j)));
end
                                                    end
for j=1:length(x2)
                                                    Tnew=0.5*Told+0.5*h*sumy;
   sn2=sn2+sin(x2(j))/x2(j);
                                                    Snew=(4*Tnew-Told)/3;
end
                                                    Cnew=(16*Snew-Sold)/15;
sn=(1+sin(1)/1+4*sn2+2*sn1)/120
                                                    Rnew=(64*Cnew-Cold)/63;
```

```
A=[A;i,Tnew,Snew,Cnew,Rnew];
                                                    h=h/2;
                                                    Told=Tnew; Sold=Snew; Cold=Cnew; Rold=Rnew;
                                                 end
%练习 8.11 (2)
                                                %练习 8.11 (3)
interval=[0,3];
                                                 interval=[0,3];
a=interval(1);
                                                 a=interval(1);
b=interval(2);
                                                 b=interval(2);
h=b-a;
                                                 h=b-a;
syms x
                                                 syms x
                                                 y=x^{(5/2)};
y=x*sqrt(1+x^2);
Told=eval(subs(y,x,a))+eval(subs(y,x,b));
                                                 Told=eval(subs(y,x,a))+eval(subs(y,x,b));
Sold=NaN;Cold=NaN;
                                                 Sold=NaN;Cold=NaN;Rold=NaN;
Rold=NaN;
                                                 A=[0,Told,Sold,Cold,Rold];
A=[0,Told,Sold,Cold,Rold];
                                                 for i=1:9
for i=1:9
                                                     intervalx=a+h/2:h:b-h/2;
   intervalx=a+h/2:h:b-h/2;
                                                    sumy=0;
                                                    for j=1:length(intervalx)
   sumy=0;
   for j=1:length(intervalx)
                                                 sumy=sumy+eval(subs(y,x,intervalx(j)));
sumy=sumy+eval(subs(y,x,intervalx(j)));
                                                     end
   end
                                                     Tnew=0.5*Told+0.5*h*sumy;
   Tnew=0.5*Told+0.5* h*sumy;
                                                     Snew=(4*Tnew-Told)/3;
   Snew=(4*Tnew-Told)/3;
                                                     Cnew=(16*Snew-Sold)/15;
   Cnew=(16*Snew-Sold)/15;
                                                     Rnew=(64*Cnew-Cold)/63;
   Rnew=(64*Cnew-Cold)/63;
                                                    A=[A;i,Tnew,Snew,Cnew,Rnew];h=h/2;
   A=[A;i,Tnew,Snew,Cnew, Rnew];
                                                    Told=Tnew;Sold=Snew;Cold=Cnew;Rold=Rnew;
   h=h/2; Told=Tnew;
                                                 end
   Sold=Snew;Cold=Cnew;Rold=Rnew;
end
Α
```

五、实验结果(包含图表)

练习 8.4 中,n=10 时 $s_n=0.9461$,n=20 时 $s_n=0.9461$ 。

练习 8.11 中,求11的表格结果为

>> exp15194694_8_2								
A =								
0	1. 6829	NaN	NaN	NaN				
1.0000	1.8415	1.8943	NaN	NaN				
2. 0000	1.8003	1.8394	NaN	NaN				
3.0000	1.8494	1.8658	1.8675	NaN				
4. 0000	1.8716	1.8790	1.8798	1.8800				
5. 0000	1.8821	1.8856	1.8860	1.8861				
6. 0000	1.8872	1.8889	1.8891	1.8891				
7. 0000	1.8897	1. 8905	1. 8906	1.8906				
8. 0000	1.8909	1.8913	1.8914	1.8914				
9. 0000	1.8915	1. 8918	1. 8918	1. 8918				
	A = 0 1.0000 2.0000 3.0000 4.0000 5.0000 6.0000 7.0000 8.0000	A = 0 1.6829 1.0000 1.8415 2.0000 1.8003 3.0000 1.8494 4.0000 1.8716 5.0000 1.8821 6.0000 1.8872 7.0000 1.8897 8.0000 1.8909	A = 0 1.6829 NaN 1.0000 1.8415 1.8943 2.0000 1.8003 1.8394 3.0000 1.8494 1.8658 4.0000 1.8716 1.8790 5.0000 1.8821 1.8856 6.0000 1.8872 1.8889 7.0000 1.8897 1.8905 8.0000 1.8909 1.8913	A = 0				

求 I_2 的表格结果为

>> exp15194694_8_3 9. 4868 NaN NaN NaN 8. 7997 8. 5706 1.0000 NaN NaN 9. 2579 9. 4107 9. 4667 2.0000 NaN 3.0000 9.6734 9.8119 9.8387 9.8446 4.0000 9. 9258 10. 0099 10. 0231 10. 0261 10. 0630 10. 1088 10. 1154 10. 1168 5.0000 6.0000 10. 1344 10. 1582 10. 1615 10. 1622 7. 0000 10. 1708 10. 1829 10. 1845 10. 1849 8.0000 10.1891 10.1952 10.1961 10.1962 10. 1983 10. 2014 10. 2018 10. 2019 9.0000

求 I_3 的表格结果为

>> exp15194694_8_4 0 15. 5885 NaN NaN 1.0000 11. 9277 10. 7075 NaN NaN 2.0000 12. 0245 12. 0568 12. 1468 NaN 12. 5397 12. 7115 12. 7551 12. 7648 3.0000 4.0000 12. 9125 13. 0367 13. 0584 13. 0632 5. 0000 13. 1275 13. 1992 13. 2100 13. 2124 6.0000 13. 2421 13. 2803 13. 2858 13. 2870 7.0000 13. 3012 13. 3209 13. 3236 13. 3242 8. 0000 13. 3312 13. 3412 13. 3426 13. 3429 9. 0000 13. 3463 13. 3514 13. 3521 13. 3522

六、实验结果分析(实验总结、心得体会)

通过本次实验,学习了复合辛普森法、Romberg 法求数值积分,掌握了运用他们来求积分。

注: 如果报告超过1页,需双面打印。