NA HW5

Problem 1. $\int_a^b f(x)dx \approx \frac{b-a}{6}[f(a)+4f(\frac{a+b}{2})+f(b)]$ 三次代数精度.

由辛普森公式:

$$\int_a^b f(x)dx = \frac{b-a}{6}[f(a)+f(b)+4f(\frac{a+b}{2})] - \frac{(\frac{b-a}{2})^5}{90}f^{(4)}(\xi)$$

余项为0阶导, 具有三次代数精度.

Problem 3

(1): Trapezoidal

a. $\int_{-0.25}^{0.25}\cos^2 x\,dx = \frac{0.5}{2}\cdot(\cos^2\frac{1}{4}+\cos^2 0) = \frac{1}{2}\cos^2\frac{1}{4} = 0.4690$

b. $\int_{-0.5}^{0} x\ln(x+1) = \frac{0.5}{2}(0-\frac{1}{2}\ln(\frac{1}{2})) = \frac{1}{8}\ln 2 = 0.08664$

c. $\int_{0.75}^{1.3}(\sin^2 x - x\sin x+1)\,dx = \frac{0.55}{2}[f(1.3)+f(0.75)] = -0.03702$

d. $\int_e^{e+1}\frac{1}{x\ln x}dx = \frac{1}{2}(\frac{1}{e}+\frac{1}{(e+1)\ln(e+1)}) = 0.2863$

(2): Simpson's

a. 原式 $= \frac{0.25}{3}[f(-0.25)+4f(0)+f(0.25)] = 0.4858$

b. 原式 $= \frac{0.25}{3}[f(-0.5)+4f(-0.25)+f(0)] = 0.05585$

c. 原式 $= \frac{0.55}{6}[f(0.75)+4f(1.025)+f(1.3)] = -0.02027$

d. 原式 $= \frac{1}{6}[f(e)+4f(e+\frac{1}{2})+f(e+1)] = 0.2827$

Problem 4 code is in file.

a. 1.4528
b. 0.3279
c. 1.3870
d. 0.6318

Problem 5. code is in the file

```
ti=1.000000,  1.000000
ti=1.100000,  1.008264
ti=1.200000,  1.021689
ti=1.300000,  1.038515
ti=1.400000,  1.057668
ti=1.500000,  1.078461
ti=1.600000,  1.100432
ti=1.700000,  1.123262
ti=1.800000,  1.146724
ti=1.900000,  1.170652
The result is 1.170652
```

```
ti=1.000000,  0.200000
ti=1.200000,  0.438889
ti=1.400000,  0.721243
ti=1.600000,  1.052038
ti=1.800000,  1.437251
ti=2.000000,  1.884261
ti=2.200000,  2.402270
ti=2.400000,  3.002837
ti=2.600000,  3.700601
ti=2.800000,  4.514277
The result is 4.514277
```