

# 소재수치해석 HW6

20140850

신소재공학과 김민정

# Algorithm

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$$f(x) = 0.2 + 25x - 200x^2 + 675x^3 - 900x^4 + 400x^5$$

주어진 식을 0~0.8구간에서

1. Midpoint

2. Simpson

이용하여 적분

# Code-Midpoint

```
doubleprecision::A,B,s_mid,s_sim,m_er,s_er,sol
integer::n !구간개수
A=0
B=0.8
sol=1.64053334
```

```
open(unit=1,file='result.txt')
do n=2,40
  call midpoint(A,B,n,s_mid)
  call simpson(A,B,n,s_sim)
  m_er=abs(sol-s_mid)
  s_er=abs(sol-s_sim)
  print*,"구간개수:",n
  print*,"midpoint:",s_mid,"mid_error:",m_er
  print*,"simpson:",s_sim,"sim_error:",s_er
  write(1,*),n,s_mid,m_er,s_sim,s_er
end do
```

```
close(1)
```

```
contains
```

```
subroutine midpoint(A,B,n,s_mid)
```

```
subroutine simpson(A,B,n,s_sim)
```

```
subroutine midpoint(A,B,n,s_mid)
  doubleprecision,intent(in)::A,B
  doubleprecision,intent(inout)::s_mid
  integer,intent(in)::n
  doubleprecision::f,x,h
  integer i
  s_mid=0.0
  h=(B-A)/n
  x=A+h/2
  do i=1,n
    f=0.2+25*x-200*x*x+675*x*x*x-900*x*x*x*x+400*x*x*x*x*x
    s_mid=s_mid+f*h
    x=x+h
  end do
```

```
end subroutine
```

# Code-Simpson

```
subroutine simpson(A,B,n,s_sim)
  doubleprecision,intent(in)::A,B
  doubleprecision,intent(inout)::s_sim
  integer,intent(in)::n
  doubleprecision::x,k,h
  doubleprecision,dimension(4)::f
  integer i,j
  s_sim=0.0
  h=(B-A)/n
  x=A
  i=1
  do
    if(i>n-3) exit
    k=x
    do j=1,3
      f(j)=0.2+25*k-200*k*k+675*k*k*k-900*k*k*k*k+400*k*k*k*k*k
      k=k+h
    end do
    s_sim=s_sim+(f(1)+4*f(2)+f(3))*h/3
    x=x+2*h
    i=i+2
  end do
  if(2*(n/2)==n) then
    k=x
    do j=1,3
      f(j)=0.2+25*k-200*k*k+675*k*k*k-900*k*k*k*k+400*k*k*k*k*k
      k=k+h
    end do
    s_sim=s_sim+(f(1)+4*f(2)+f(3))*h/3
  else
    k=x
    do j=1,4
      f(j)=0.2+25*k-200*k*k+675*k*k*k-900*k*k*k*k+400*k*k*k*k*k
      k=k+h
    end do
    s_sim=s_sim+(f(1)+3*f(2)+3*f(3)+f(4))*3*h/8
  end if
end subroutine
```

# Result

```
구간개수:      30
midpoint:      1.6419543808216606   mid_error:      1.4210527653251148E-003
simpson:       1.6405279445739482   sim_error:      5.3834823872112025E-006
구간개수:      31
midpoint:      1.6418642495247586   mid_error:      1.3309214684231740E-003
simpson:       1.6405321705324929   sim_error:      1.1575238425542977E-006
구간개수:      32
midpoint:      1.6417824270546828   mid_error:      1.2490989983473533E-003
simpson:       1.6405291718166926   sim_error:      4.1562396428940218E-006
구간개수:      33
midpoint:      1.6417079228778690   mid_error:      1.1745948215335922E-003
simpson:       1.6405322804429858   sim_error:      1.0476133496251094E-006
구간개수:      34
midpoint:      1.6416398897561966   mid_error:      1.1065616998611194E-003
simpson:       1.6405300690460913   sim_error:      3.2590102441165669E-006
구간개수:      35
midpoint:      1.6415775995771131   mid_error:      1.0442715207776843E-003
simpson:       1.6405323967030496   sim_error:      9.3135328582683030E-007
구간개수:      36
midpoint:      1.6415204238087824   mid_error:      9.8709575244693148E-004
simpson:       1.6405307372538012   sim_error:      2.5908025342857854E-006
구간개수:      37
midpoint:      1.6414678175959534   mid_error:      9.3448953961794423E-004
simpson:       1.6405325079146573   sim_error:      8.2014167812616279E-007
구간개수:      38
midpoint:      1.6414193067417295   mid_error:      8.8597868539408431E-004
simpson:       1.6405312431443206   sim_error:      2.0849120148103140E-006
구간개수:      39
midpoint:      1.6413744769920540   mid_error:      8.4114893571851646E-004
simpson:       1.6405326093213388   sim_error:      7.1873499662977736E-007
구간개수:      40
midpoint:      1.6413329651689312   mid_error:      7.9963711259578574E-004
simpson:       1.6405316318165826   sim_error:      1.6962397528796913E-006
```

```
Process returned 0 (0x0)   execution time : 0.488 s
Press any key to continue.
```

# Result

