問題の解答例

※問題 1

```
      PROGRAM MON1
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      READ(5,*) N1,N2,N3
      P1=FLOAT(N1)
      P2=FLOAT(N2)
      P3=FLOAT(N3)
      Y=13.5D0*P1+4.9D0*P2+5.2D0/P3
      IY=INT(Y)
      WRITE(6,*) IY
      END
```

※問題 2

```
      PROGRAM MON2
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      READ(5,*) A,B,C
      ROOT=SQRT(B**2-4.0D0*A*C)
      X1=(-B+ROOT)/(2.0D0*A)
      X2=(-B-ROOT)/(2.0D0*A)
      WRITE(6,*) X1,X2
      END
```

※問題 3

```
      PROGRAM MON3
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      DO 100 I=1,20
      XI=FLOAT(I)
      Y=SQRT(XI)
      WRITE(6,*) Y
  100 CONTINUE
      END
```

※問題 4

```
      PROGRAM MON4
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      READ(5,*) N
      M=0
      DO 10 I=1,N
      M=M+I
   10 CONTINUE
      WRITE(6,*) M
      MM=0
      DO 20 I=1,N
      MM=MM+I**2
   20 CONTINUE
      WRITE(6,*) MM
      END
```

※問題 5

```
      PROGRAM MON5
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      L=1
      DO 100 I=1,10
      L=L*I
  100 CONTINUE
      WRITE(6,*) L
      END
```

※問題 6

```
      PROGRAM MON6
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      READ(5,*) WW
      DO 100 I=1,10
      RI=2.0D0*FLOAT(I)
      CC=WW**(1.0D0/RI)
      WRITE(6,*) CC
  100 CONTINUE
      END
```

※問題 7

```
      PROGRAM MON7
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      S=0.0
      DO 100 I=1,15
      READ(5,*) X
      S=S+X
  100 CONTINUE
      WRITE(6,*) S
      END
```

※問題８

```
      PROGRAM MON8
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      READ(5,*) M
      J=M-INT(M/2)*2
      K0=100
      K1=999
      IF(J.EQ.0) WRITE(6,*) K0
      IF(J.EQ.1) WRITE(6,*) K1
      END
```

※問題８ａ

```
      PROGRAM MON8A
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      READ(5,*) N
      M=0
      KK=0
   10 CONTINUE
      KK=KK+1
      M=M+KK
      IF(KK.NE.N) GO TO 10
      WRITE(6,*) M
C
      MM=0
      JJ=0
   20 CONTINUE
      JJ=JJ+1
      MM=MM+JJ**2
      IF(JJ.NE.N) GO TO 20
      WRITE(6,*) MM
      END
```

※問題９

```
      PROGRAM MON9
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      READ(5,*) N1,N2,N3
      P1=FLOAT(N1)
      P2=FLOAT(N2)
      P3=FLOAT(N3)
      IF(P3.EQ.0.0) THEN
      WRITE(6,*) 'X3=0 UNABLE TO CALCULATE Y'
      STOP
      END IF
      Y=13.5*P1+4.8*P2+5.2/P3
      IY=INT(IY)
      END
```

※問題１０

§5 1312参照

※問題１１

```
      PROGRAM MON11
      IMPLICIT REAL*8(A-H,O-Z)
      DIMENSION A(5),B(5)
      OPEN(3,FILE='C:XYZ.DAT')
      OPEN(4,FILE='C:XYZ2.DAT')
      OPEN(7,FILE='C:XYZ3.DAT')
      READ(3,*) (A(I),I=1,5)
      DO 100 I=1,5
      B(I)=A(I)*3.0
  100 CONTINUE
      WRITE(4,110) (B(I),I=1,5)
      WRITE(7,110) (B(I),I=1,5)
      CLOSE(3)
      CLOSE(4)
      CLOSE(7)
  110 FORMAT(3X,5E11.3)
      END
```

※問題１２

本文中に記載

※問題１３

```
      PROGRAM MON13
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      DATA PI/3.14159265358979E0/
      OPEN(1,FILE='C:SINX.DAT')
C
      DO 100 I=1,20
      XI=FLOAT(I)*PI/10.0
      YI=SIN(XI)
      WRITE(6,*) XI,YI
  100 CONTINUE
C
      CLOSE(1)
      END
```

※問題１４

```
      PROGRAM MON14
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      DATA PI/3.14159265358979E0/
      OPEN(8,FILE='C:SINX.DAT')
C
      SUM=0.0E0
      DO 100 I=1,20
      READ(1,*) XI,YI
      SUM=SUM+YI*PI/10.0E0
  100 CONTINUE
      WRITE(6,*) SUM
C
      CLOSE(8)
      END
```

※問題１５

```
      PROGRAM MON15
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      READ(5,*) N
      IS=0
      DO 10 K=0,N
      IS=IS+(2*K+1)**2
   10 CONTINUE
      WRITE(6,100) IS
  100 FORMAT(3X,I10)
      END
```

※問題１６

```
      PROGRAM MON16
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      READ(5,*) N
      IS=1
      DO 10 K=2,N
      IS=IS*(K-1)**2
   10 CONTINUE
      WRITE(6,100) IS
  100 FORMAT(3X,I10)
      END
```

※問題１７

```
      PROGRAM MON17
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      DO 100 I=1,17
      X=0.2*FLOAT(I-1)+0.1
      Y=1.3*X**4-0.9*X**3+6.3*X**2+0.4*X+2.2
      WRITE(6,120) X,Y
  100 CONTINUE
  120 FORMAT(3X,F3.1,3X,E12.5)
      END
```

※問題１８

```
      PROGRAM MON18
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      READ(5,*) N
      IS=1
      DO 100 J=1,N
      L=2*(J-1)+1
      IS=IS*L
  100 CONTINUE
      WRITE(6,200) IS
  200 FORMAT(3X,'(2N-10)!!=',I10)
      END
```

※問題１９

```
      PROGRAM MON19
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      READ(5,*) X
      READ(5,*) M
      L=1
      SUM=1.0
      DO 100 N=1,M
      L=L*N
      SUM=SUM+X**N/FLOAT(L)
  100 CONTINUE
      Y=EXP(X)
      WRITE(6,200) SUM,Y
  200 FORMAT(3X,'EXP(X)=',E17.10,2X,'MACLAURIN=',E17.10)
      END
```

※問題２０

```
      PROGRAM MON20
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      PI=3.14159265358979323846264338327 9E0
      READ(5,*) N
      FN=FLOAT(N)
      PSN=1.0
      DO 100 I=1,N-1
      FI=FLOAT(I)
      PSN=PSN*SIN(FI*PI/FN)
  100 CONTINUE
      WRITE(6,120) PSN
      UHN=FN/(2.0**(N-1))
      WRITE(6,130) UHN
  120 FORMAT(3X,'LEFT-HAND =',E25.17)
  130 FORMAT(3X,'RIGHT-HAND=',E25.17)
      END
```

※問題２１

```
      PROGRAM MON21
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      READ(5,*) X1,Y1,Z1
      READ(5,*) X2,Y2,Z2
      R=SQRT((X1-X2)**2+(Y1-Y2)**2+(Z1-Z2)**2)
      WRITE(6,100) R
  100 FORMAT(3X,'DISTANCE=',1X,E12.5)
      END
```

※問題２２

```
      PROGRAM MON22
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      READ(5,*) A,B,C
      W=0.5*(A+B+C)
      S=SQRT(W*(W-A)*(W-B)*(W-C))
      WRITE(6,100) S
  100 FORMAT(3X,'AREA OF TRIANGLE = ',E12.5)
      END
```

※問題２３

```
      PROGRAM MON23
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      IOLD=0
      ILAST=1
      WRITE(6,200) IOLD
      WRITE(6,200) ILAST
      DO 100 I=1,18
      INEW=IOLD+ILAST
      WRITE(6,200) INEW
      IOLD=ILAST
      ILAST=INEW
  100 CONTINUE
C
  200 FORMAT(3X,I10)
      END
```

※問題２４

```
      PROGRAM MON24
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      READ(5,*) N
      SUM=0.0
      WUM=1.0
      DO 100 I=1,N
      READ(5,*) A
      SUM=SUM+A
      WUM=WUM*A
  100 CONTINUE
      ARM=SUM/FLOAT(N)
      GEM=WUM**(1.0/FLOAT(N))
      WRITE(6,200) ARM,GEM
  200 FORMAT(2X,'ARITHMETIC MEAN = ',E17.8,3X,'GEOMETRIC MEAN = ',E17.8)
      END
```

※問題２５

```
      PROGRAM MON25
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      READ(5,*) N
C
      READ(5,*) M0
      IG=M0
      IS=M0
      DO 100 I=1,N-1
      READ(5,*) M
      IF(M.GT.IG) IG=M
      IF(M.LT.IS) IS=M
  100 CONTINUE
      WRITE(6,200) IG,IS
  200 FORMAT(2X,'MAX = ',I10,3X,'MIN = ',I10)
      END
```

※問題２６

```
      PROGRAM MON26
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      READ(5,*) PPA
      GPA=PPA/1.0E9
      WPA=PPA/1.0E6
      RPA=PPA/1.0E3
      WRITE(6,100) GPA
      WRITE(6,200) WPA
      WRITE(6,300) RPA
      WRITE(6,400) PPA
  100 FORMAT(3X,'P = ',E25.12,'GPA')
  200 FORMAT(3X,'P = ',E25.12,'MPA')
  300 FORMAT(3X,'P = ',E25.12,'KPA')
  400 FORMAT(3X,'P = ',E25.12,' PA')
      END
```

※問題２７

```
      PROGRAM MON27
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      GO TO 30
   10 CONTINUE
      WRITE(6,20)
   20 FORMAT(2X,'INPUT LARGER ITERATION VALUE (>=1000
   30 CONTINUE
      READ(5,*) NB
      IF(NB.LT.1000) GO TO 10
      NA=0
      DO 100 I=1,NB
      X=RANDOM(0)
      Y=RANDOM(0)
      R2=X**2+Y**2
      IF(R2.LE.1.0) NA=NA+1
      ISTEP=I-(I/1000)*1000
      IF(ISTEP.EQ.0.OR.I.EQ.NB) THEN
      S=FLOAT(NA)/FLOAT(I)
      PI=4.0*S
      WRITE(6,200) I,PI
      END IF
  100 CONTINUE
  200 FORMAT(3X,'STEP = ',I10,3X,'PI = ',F20.16)
      END
```

※問題２８　略

※問題２９　本文中に記載

※問題３０　略

※問題３１　§7-1(b)中に記載

※問題３２　略

※問題３３

※問題３４　略

※問題３５

※問題３６　3次関数へのfit方法を考える必要

※問題３７

※問題３８

```
      PROGRAM MON38
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      DIMENSION X(100),Y(100)
      CHARACTER*15 IFLI
      WRITE(6,101)
  101 FORMAT(3X,'INPUT FILE NAME FOR DATA')
      READ(5,102) IFLI
  102 FORMAT(A15)

      OPEN(1,FILE=IFLI)

      WRITE(6,103)
  103 FORMAT(3X,'INPUT THE NUMBER OF DATA POINTS')
      READ(5,*) N
      PN=FLOAT(N)

      DO 100 I=1,N
      READ(1,*) X(I),Y(I)
      Y(I)=LOG(Y(I))
      X(I)=1.0/X(I)
  100 CONTINUE

      S0=PN
      S1=0.0
      S2=0.0
      S3=0.0
      T0=0.0
      T1=0.0
      DO 200 I=1,N
      S1=S1+X(I)
      S2=S2+X(I)**2
      S3=S3+X(I)**3
      S4=S4+X(I)**4
      T0=T0+Y(I)
      T1=T1+Y(I)*X(I)
      T2=T2+Y(I)*X(I)**2
  200 CONTINUE

      DD=S0*S2-S1**2
      DD0=T0*S2-T1*S1
      DD1=S0*T1-T0*S1

      A0=DD0/DD
      A1=DD1/DD
      A2=D3/D

      A00=EXP(A0)
      WRITE(6,301) A0,A00,A1
  301 FORMAT(3X,'A0 = ',E12.5,2X,'A00 = ',E12.5,2X,'A1 = ',E12.5)
      CLOSE(1)
      END
```

※問題３９

```
      PROGRAM MON39
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      DIMENSION X(100),Y(100)
      CHARACTER*15 IFLI
      WRITE(6,101)
  101 FORMAT(3X,'INPUT FILE NAME FOR DATA')
      READ(5,102) IFLI
  102 FORMAT(A15)
C
      OPEN(1,FILE=IFLI)
C
      WRITE(6,103)
  103 FORMAT(3X,'INPUT THE NUMBER OF DATA POINTS')
      READ(5,*) N
      PN=FLOAT(N)
C
      DO 100 I=1,N
      READ(1,*) X(I),Y(I)
      Y(I)=LOG(Y(I))
      X(I)=1.0/X(I)
  100 CONTINUE
C
      S0=PN
      S1=0.0
      S2=0.0
      S3=0.0
      T0=0.0
      T1=0.0
      DO 200 I=1,N
      S1=S1+X(I)
      S2=S2+X(I)**2
C     S3=S3+X(I)**3
C     S4=S4+X(I)**4
      T0=T0+Y(I)
      T1=T1+Y(I)*X(I)
C     T2=T2+Y(I)*X(I)**2
  200 CONTINUE
C
      DD=S0*S2-S1**2
      DD0=T0*S2-T1*S1
      DD1=S0*T1-T0*S1
C
      A0=DD0/DD
      A1=(DD1/DD)*8.31
C     A2=D3/D
C
```

↓

```
      A00=EXP(A0)
      WRITE(6,301) A0,A00,A1
  301 FORMAT(3X,'A0 = ',E12.5,2X,'A00 = ',E12.5,2X,'A1 = ',E
      CLOSE(1)
      END
```

※問題４４

```
      PROGRAM MON44
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      H=0.5
      Y1=0.6065
      Y2=1.0000
      Y3=2.7183
      Y4=4.4817
      F1=(Y1-8.0*Y2+8.0*Y3-Y4)/(12.0*H)
      WRITE(6,200) F1
      G1=(Y3-Y2)/(2.0*H)
      WRITE(6,230) G1
C  RIGOROUS VALUE
      FF1=1.6487
      WRITE(6,300) FF1
C
 200  FORMAT(15X,' F1 (4-POINT)  = ',F7.4)
 230  FORMAT(15X,' G1 (2-POINT)  = ',F7.4)
 300  FORMAT(15X,'RIGOROUS VALUE = ',F7.4)
      END
```

※問題４５

```
      PROGRAM MON45
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      READ(5,*) X
      READ(5,*) H
      X0=X
      X1=X+H
      X2=X-H
      Y0=X*EXP(X)
      Y1=X1*EXP(X1)
      Y2=X2*EXP(X2)
      F1=(Y1-Y2)/(2.0*H)
      F2=(Y1-2.0*Y0+Y2)/(H**2)
C  RIGOROUS VALUE
      G1=EXP(X0)*(1.0+X0)
      G2=EXP(X0)*(2.0+X0)
      GOSA1=(F1-G1)/G1*100.0
      GOSA2=(F2-G2)/G2*100.0
C
      WRITE(6,101) F1,G1
      WRITE(6,102) GOSA1
 101  FORMAT(2X,'F1 = ',E13.6,2X,'RIGOROUS = ',E13.6)
 102  FORMAT(2X,'  ERROR (%) = ',E13.6)
      WRITE(6,103) F2,G2
      WRITE(6,104) GOSA2
 103  FORMAT(2X,'F2 = ',E13.6,2X,'RIGOROUS = ',E13.6)
 104  FORMAT(2X,'  ERROR (%) = ',E13.6)
      END
```

※問題４６

※問題４７

```
      PROGRAM MON47
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
C  INPUT THE NUMBER OF DISCRETE POINTS
      READ(5,*) N
      X0=0.0
      XN=1.0
      PN=FLOAT(N)
      H=(XN-X0)/PN
C
      Y0=SQRT(1.0-X0**2)
      YN=SQRT(1.0-XN**2)
C
      SUM=0.0
      DO 10 I=1,N-1
      X=X0+H*FLOAT(I)
      Y=SQRT(1.0-X**2)
      SUM=SUM+Y
   10 CONTINUE
      FF=0.5*H*(Y0+2.0*SUM+YN)
      AREA=FF*4.0
      WRITE(6,101) AREA
  101 FORMAT(3X,'PI = ',F10.8)
      END
```

※問題４８

```
      PROGRAM MON48
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
C  INPUT THE NUMBER OF DISCRETE POINTS
      READ(5,*) N
      X0=1.0
      XN=2.0
      PN=FLOAT(N)
      H=(XN-X0)/PN
      WRITE(6,33) H
   33 FORMAT(3X,'H  = ',F7.5)
C
      Y0=1.0/1.0**2
      YN=1.0/2.0**2
C
      SUM=0.0
C
      IF(N.GT.1) THEN
      DO 10 I=1,N-1
      X=X0+H*FLOAT(I)
      Y=1.0/X**2
      SUM=SUM+Y
   10 CONTINUE
      END IF
C
      FF=0.5*H*(Y0+2.0*SUM+YN)
      WRITE(6,101) FF
  101 FORMAT(3X,'INTEGRAL = ',F10.8)
      END
```

※問題４０ ）略
※問題４１ ）略

※問題４２

```
      PROGRAM MON42
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      X=1.0
      DO 100 I=0,9
      H=0.10-0.01*FLOAT(I)
      Y1=EXP(X+H)
      Y2=EXP(X-H)
      F1=(Y1-Y2)/(2.0*H)
      WRITE(6,200) H,F1
  100 CONTINUE
C RIGOROUS VALUE
      FF1=EXP(X)
      WRITE(6,300) FF1
C
  200 FORMAT(3X,'H = ',F4.2,3X,'F1 = ',E25.12)
  300 FORMAT(15X,'RIGOROUS VALUE = ',E25.12)
      END
```

```
      PROGRAM MON42A
      IMPLICIT REAL*4(A-H,O-Z),INTEGER*4(I-N)
      X=1.0
      DO 100 I=0,9
      H=0.10-0.01*FLOAT(I)
      Y1=EXP(X+H)
      Y2=EXP(X-H)
      F1=(Y1-Y2)/(2.0*H)
      WRITE(6,200) H,F1
  100 CONTINUE
C RIGOROUS VALUE
      FF1=EXP(X)
      WRITE(6,300) FF1
C
  200 FORMAT(3X,'H = ',F4.2,3X,'F1 = ',E25.12)
  300 FORMAT(15X,'RIGOROUS VALUE = ',E25.12)
      END
```

```
      PROGRAM MON42B
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      X=1.0
      DO 100 I=0,7
      H=0.000004-0.0000005*FLOAT(I)
      Y1=EXP(X+H)
      Y2=EXP(X-H)
      F1=(Y1-Y2)/(2.0*H)
      WRITE(6,200) H,F1
  100 CONTINUE
C RIGOROUS VALUE
      FF1=EXP(X)
      WRITE(6,300) FF1
C
  200 FORMAT(3X,'H = ',F9.7,3X,'F1 = ',E25.17)
  300 FORMAT(15X,'RIGOROUS VALUE = ',E25.17)
      END
```

```
      PROGRAM MON42C
      IMPLICIT REAL*4(A-H,O-Z),INTEGER*4(I-N)
      X=1.0
      DO 100 I=0,7
      H=0.000004-0.0000005*FLOAT(I)
      Y1=EXP(X+H)
      Y2=EXP(X-H)
      F1=(Y1-Y2)/(2.0*H)
      WRITE(6,200) H,F1
  100 CONTINUE
C RIGOROUS VALUE
      FF1=EXP(X)
      WRITE(6,300) FF1
C
  200 FORMAT(3X,'H = ',F9.7,3X,'F1 = ',E25.17)
  300 FORMAT(15X,'RIGOROUS VALUE = ',E25.17)
      END
```

※問題４３

```
      PROGRAM MON43
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      X=1.0
      DO 100 I=0,9
      H=0.10-0.01*FLOAT(I)
      Y1=EXP(X+H)
      Y2=EXP(X+H/2.0)
      Y3=EXP(X-H/2.0)
      Y4=EXP(X-H)
      F1=-(Y1-8.0*Y2+8.0*Y3-Y4)/(6.0*H)
      WRITE(6,200) H,F1
  100 CONTINUE
C RIGOROUS VALUE
      FF1=EXP(X)
      WRITE(6,300) FF1
C
  200 FORMAT(3X,'H = ',F4.2,3X,'F1 = ',E25.12)
  300 FORMAT(15X,'RIGOROUS VALUE = ',E25.12)
      END
```

※問題４９

```
      PROGRAM MON49
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      PI=3.14159265358979
C  INPUT THE NUMBER OF DISCRETE POINTS
      READ(5,*) N
      X0=0.0
      XN=PI
      PN=FLOAT(N)
      H=(XN-X0)/PN
      WRITE(6,33) N,H
   33 FORMAT(3X,'NUMBER OF POINTS = ',I7,3X,'H  = ',F12.10)
C
      Y0=0.0
      YN=0.0
C
      SUM=0.0
C
      DO 10 I=1,N-1
      X=X0+H*FLOAT(I)
      Y=X*SIN(X)
      SUM=SUM+Y
   10 CONTINUE
C
      FF=0.5*H*(Y0+2.0*SUM+YN)
      WRITE(6,101) FF
      WRITE(6,102) PI
  101 FORMAT(3X,'INTEGRAL = ',F12.10)
  102 FORMAT(3X,'RIGOROUS = ',F12.10)
      END
```

※問題５０

```
      PROGRAM MON50
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      PI=3.141592653579893238
      A=2.0
C   SHOW THE VALUES OF F(X) FOR SOME VALUES OF X
      DO 1000 I=1,5
      X=FLOAT(I)
      Y=EXP(-A*X**2)
      WRITE(6,200) X,Y
 1000 CONTINUE
  200 FORMAT(2X,'X = ',F5.1,2X,'EXP(-2*X**2) = ',E
```

↓ 下に続く

```
C   INPUT THE UPPER LIMIT OF INTEGRATION RANGE
      WRITE(6,51)
   51 FORMAT(3X,'INPUT THE UPPER LIMIT OF INTEGRATION RAN
      READ(5,*) XN
      X0=0.0
C   INPUT THE NUMBER OF DISCRETE POINTS
      WRITE(6,52)
   52 FORMAT(3X,'INPUT THE NUMBER OF DISCRETE POINTS')
      READ(5,*) N
      PN=FLOAT(N)
      H=(XN-X0)/PN
      WRITE(6,33) XN
      WRITE(6,34) N,H
   33 FORMAT(3X,'UPPER LIMIT =',E12.5)
   34 FORMAT(3X,'NUMBER OF POINTS = ',I7,3X,'H  = ',F12.1
C
      Y0=1.0
      YN=EXP(-A*XN**2)
C
      SUM=0.0
C
      DO 10 I=1,N-1
      X=X0+H*FLOAT(I)
      Y=EXP(-A*X**2)
      SUM=SUM+Y
   10 CONTINUE
C
      FF=0.5*H*(Y0+2.0*SUM+YN)
      WRITE(6,101) FF
  101 FORMAT(3X,'INTEGRAL = ',E25.10)
C
      GG=0.5*SQRT(PI/A)
      WRITE(6,102) GG
  102 FORMAT(3X,'RIGOROUS = ',E25.10)
      END
```

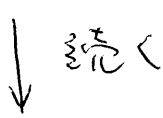
```
      PROGRAM MON50A
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      PI=3.141592653579893238
      A=2.0
C   SHOW THE VALUES OF F(X) FOR SOME VALUES OF X
      DO 1000 I=1,5
      X=FLOAT(I)
      Y=X**2*EXP(-A*X**2)
      WRITE(6,200) X,Y
 1000 CONTINUE
 200  FORMAT(2X,'X = ',F5.1,2X,'X**2*EXP(-2*X**2) = ',E12.5)
C
C   INPUT THE UPPER LIMIT OF INTEGRATION RANGE
      WRITE(6,51)
 51   FORMAT(3X,'INPUT THE UPPER LIMIT OF INTEGRATION RANGE')
      READ(5,*) XN
      X0=0.0
C   INPUT THE NUMBER OF DISCRETE POINTS
      WRITE(6,52)
 52   FORMAT(3X,'INPUT THE NUMBER OF DISCRETE POINTS')
      READ(5,*) N
      PN=FLOAT(N)
      H=(XN-X0)/PN
      WRITE(6,33) XN
      WRITE(6,34) N,H
  33  FORMAT(3X,'UPPER LIMIT =',E12.5)
  34  FORMAT(3X,'NUMBER OF POINTS = ',I7,3X,'H  = ',F12.10)
C
      Y0=1.0
      YN=XN**2*EXP(-A*XN**2)
C
      SUM=0.0
C
      DO 10 I=1,N-1
      X=X0+H*FLOAT(I)
      Y=X**2*EXP(-A*X**2)
      SUM=SUM+Y
   10 CONTINUE
C
      FF=0.5*H*(Y0+2.0*SUM+YN)
      WRITE(6,101) FF
 101  FORMAT(3X,'INTEGRAL = ',E25.10)
C
      GG=SQRT(PI)/(4.0*A**1.5)
      WRITE(6,102) GG
 102  FORMAT(3X,'RIGOROUS = ',E25.10)
      END
```

```
      PROGRAM MON50B
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      PI=3.141592653579893238
      A=2.0
C   SHOW THE VALUES OF F(X) FOR SOME VALUES OF X
      DO 1000 I=1,5
      X=FLOAT(I)
      Y=X**3*EXP(-A*X**2)
      WRITE(6,200) X,Y
 1000 CONTINUE
 200  FORMAT(2X,'X = ',F5.1,2X,'X**3*EXP(-2*X**2) = ',E12.5)
C
C   INPUT THE UPPER LIMIT OF INTEGRATION RANGE
      WRITE(6,51)
 51   FORMAT(3X,'INPUT THE UPPER LIMIT OF INTEGRATION RANGE')
      READ(5,*) XN
      X0=0.0
C   INPUT THE NUMBER OF DISCRETE POINTS
      WRITE(6,52)
 52   FORMAT(3X,'INPUT THE NUMBER OF DISCRETE POINTS')
      READ(5,*) N
      PN=FLOAT(N)
      H=(XN-X0)/PN
      WRITE(6,33) XN
      WRITE(6,34) N,H
  33  FORMAT(3X,'UPPER LIMIT =',E12.5)
  34  FORMAT(3X,'NUMBER OF POINTS = ',I7,3X,'H  = ',F12.10)
C
      Y0=1.0
      YN=XN**3*EXP(-A*XN**2)
C
      SUM=0.0
C
      DO 10 I=1,N-1
      X=X0+H*FLOAT(I)
      Y=X**3*EXP(-A*X**2)
      SUM=SUM+Y
   10 CONTINUE
C
      FF=0.5*H*(Y0+2.0*SUM+YN)
      WRITE(6,101) FF
 101  FORMAT(3X,'INTEGRAL = ',E25.10)
C
      GG=1.0/(2.0*A**2)
      WRITE(6,102) GG
 102  FORMAT(3X,'RIGOROUS = ',E25.10)
      END
```

```
      PROGRAM MON50C
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      PI=3.141592653579893238
      A=2.0
C   SHOW THE VALUES OF F(X) FOR SOME VALUES OF X
      DO 1000 I=1,5
      X=FLOAT(I)
      Y=X**4*EXP(-A*X**2)
      WRITE(6,200) X,Y
 1000 CONTINUE
 200  FORMAT(2X,'X = ',F5.1,2X,'X**4*EXP(-2*X**2) = ',E12.5)
C
C   INPUT THE UPPER LIMIT OF INTEGRATION RANGE
      WRITE(6,51)
 51   FORMAT(3X,'INPUT THE UPPER LIMIT OF INTEGRATION RANGE')
      READ(5,*) XN
      X0=0.0
C   INPUT THE NUMBER OF DISCRETE POINTS
      WRITE(6,52)
 52   FORMAT(3X,'INPUT THE NUMBER OF DISCRETE POINTS')
      READ(5,*) N
      PN=FLOAT(N)
      H=(XN-X0)/PN
      WRITE(6,33) XN
      WRITE(6,34) N,H
  33  FORMAT(3X,'UPPER LIMIT =',E12.5)
  34  FORMAT(3X,'NUMBER OF POINTS = ',I7,3X,'H  = ',F12.10)
C
      Y0=1.0
      YN=XN**4*EXP(-A*XN**2)
C
      SUM=0.0
C
      DO 10 I=1,N-1
      X=X0+H*FLOAT(I)
      Y=X**4*EXP(-A*X**2)
      SUM=SUM+Y
   10 CONTINUE
C
      FF=0.5*H*(Y0+2.0*SUM+YN)
      WRITE(6,101) FF
 101  FORMAT(3X,'INTEGRAL = ',E25.10)
C
      GG=3.0*SQRT(PI)/(8.0*A**2.5)
      WRITE(6,102) GG
 102  FORMAT(3X,'RIGOROUS = ',E25.10)
      END
```

※問題５１

```
      PROGRAM MON51
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      PI=3.141592653579893238
C  AVOGADRO NUMBER          UNIT: /MOL
      AV=6.022045E23
C  MASS OF PARTICLE (ARGON) UNIT: KG/MOL
      TMASS=39.95E-3
C  BOLTZMANN CONSTANT       UNIT: J/K/MOL
      BK=1.380662*6.022045
C  TEMPERATURE              UNIT: K
      T=300.0
C
C  BOLTZMANN-CONST * TEMPERATURE  UNIT: J/MOL
      BKT=BK*T
C
C  PREFACTOR
      C=4.0*PI*(TMASS/(2.0*PI*BKT))**1.5
      WRITE(6,11) C
   11 FORMAT(2X,'PREFACTOR (SI UNIT) = ',E12.5)
C
      A=TMASS/(2.0*BKT)
      WRITE(6,12) A
   12 FORMAT(2X,'A (SI UNIT) =         ',E12.5)
C   SHOW THE VALUES OF F(V) FOR SOME VALUES OF V
      DO 1000 I=1,20
      V=10.0**(0.25*FLOAT(I))
      Y=V**2*EXP(-A*V**2)
      WRITE(6,200) V,Y
 1000 CONTINUE
  200  FORMAT(2X,'V = ',E12.5,2X,'V**2*EXP(-A*V**2) = ',E12.5)
C
C   INPUT THE UPPER LIMIT OF INTEGRATION RANGE
      WRITE(6,51)
   51   FORMAT(3X,'INPUT THE UPPER LIMIT OF INTEGRATION RANGE')
      READ(5,*) VN
      V0=0.0
C   INPUT THE NUMBER OF DISCRETE POINTS
      WRITE(6,52)
   52   FORMAT(3X,'INPUT THE NUMBER OF DISCRETE POINTS')
      READ(5,*) N
      PN=FLOAT(N)
      H=(VN-V0)/PN
      WRITE(6,33) VN
      WRITE(6,34) N,H
   33  FORMAT(3X,'UPPER LIMIT =',E12.5)
   34  FORMAT(3X,'NUMBER OF POINTS = ',I7,3X,'H  = ',E12.5)
C
      Y0=1.0
      YN=VN**2*EXP(-A*VN**2)
C
      SUM=0.0
C
      DO 10 I=1,N-1
      V=V0+H*FLOAT(I)
      Y=V**2*EXP(-A*V**2)
```



```
      SUM=SUM+Y
   10 CONTINUE
C
      FF=0.5*H*(Y0+2.0*SUM+YN)
      FFF=C*FF
      WRITE(6,101) FFF
  101 FORMAT(3X,'INTEGRAL = ',E25.10)
C
      GG=1.0
      WRITE(6,102) GG
  102 FORMAT(3X,'RIGOROUS = ',E25.10)
      END
```

※問題５２

```
      PROGRAM MON52
      IMPLICIT REAL*8(A-H,O-Z),INTEGER*4(I-N)
      DIMENSION CP3(12)
C  HEAT CAPACITY DATA FOR 50-270 K
      CP3(1)=11.65
      CP3(2)=16.33
      CP3(3)=19.13
      CP3(4)=20.96
      CP3(5)=22.13
      CP3(6)=22.97
      CP3(7)=23.61
      CP3(8)=24.09
      CP3(9)=24.42
      CP3(10)=24.73
      CP3(11)=25.03
      CP3(12)=25.31
C
C ENTROPY FOR T=0-15 K
      A=0.67/15.0**3
C
      S0=0.0
      SN1=0.67/15.0
      H1=(15.0-0.0)/100.0
C
      SUM1=0.0
      DO 100 I=1,99
      T=0.0+H1*FLOAT(I)
      S=A*T**2
      SUM1=SUM1+S
  100 CONTINUE
      S1=0.5*H1*(S0+2.0*SUM1+SN1)
C
C  ENTROPY FOR T=15-30 K
      S2=0.5*(30.0-15.0)*(0.67/15.0+4.77/30.0)
C
C  ENTROPY FOR T=30-290 K
      H3=20.0
C
      SN2=4.77/30.0
      SN3=25.44/290.0
      SUM3=0.0
C
      DO 200 I=1,12
      T=30.0+H3*FLOAT(I)
      S=CP3(I)/T
      SUM3=SUM3+S
  200 CONTINUE
      S3=0.5*H3*(SN2+2.0*SUM3+SN3)
C
C  ENTROPY FOR 290-300 K
      S4=0.5*(300.0-290.0)*(25.44/290.0+25.50/300.0)
C
C  TOTAL ENTROPY
      SS=S1+S2+S3+S4
C
      WRITE(6,101) SS
  101 FORMAT(3X,'ENTROPY (J/K/MOL) = ',E25.10)
C
      END
```

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