RUNGE-KUTTA 4TH ORDER METHOD

PROGRAM 1

c rk4.for

real k1,k2,k3,k4

f(x,y)=(x\*x+y\*y)/10

open(unit=1,file='rk4.in')

open(unit=2,file='rk4.out')

read(1,\*)x,y,a,b,h,n

write(2,\*)"f(x,y)=(x\*x+y\*y)/10"

write(2,\*)" "

write(2,\*)"x=",x

write(2,\*)"y=",y

write(2,\*)"a=",a

write(2,\*)"b=",b

write(2,\*)"h=",h

write(2,\*)"n=",n

write(2,\*)" "

write(2,\*)" "

yy=y

write(2,\*)"Answer: "

write(2,\*)" "

do 100 i=1,n

k1=h\*f(x,yy)

k2=h\*f(x+h/2,yy+k1/2)

write(2,\*)"k1=",k1," k2=",k2

k3=h\*f(x+h/2,yy+k2/2)

k4=h\*f(x+h,yy+k3)

write(2,\*)"k3=",k3," k4=",k4

x=x+h

yy=yy+((k1+2.0\*k2+2.0\*k3+k4)/6)

write(2,\*)"x=",x," y=",yy

write(2,\*)" "

100 continue

stop

end

INPUT FILE

0

1

0

0.4

0.1

4

OUTPUT FILE

f(x,y)=(x\*x+y\*y)/10

x= 0.00000000

y= 1.00000000

a= 0.00000000

b= 0.400000006

h= 0.100000001

n= 4

Answer:

k1= 9.99999978E-03 k2= 1.01252506E-02

k3= 1.01265088E-02 k4= 1.03035560E-02

x= 0.100000001 y= 1.01013446

k1= 1.03037162E-02 k2= 1.05330637E-02

k3= 1.05353920E-02 k4= 1.08176693E-02

x= 0.200000003 y= 1.02067757

k1= 1.08178267E-02 k2= 1.11535350E-02

k3= 1.11569799E-02 k4= 1.15468251E-02

x= 0.300000012 y= 1.03184187

k1= 1.15469769E-02 k2= 1.19914571E-02

k3= 1.19960690E-02 k4= 1.24959769E-02

x= 0.400000006 y= 1.04384482

PROGRAM 2

c rk4e1.for

real k1,k2,k3,k4

f(x,y)=(y-x)/(y+x)

open(unit=1,file='rk4e1.in')

open(unit=2,file='rk4e1.out')

read(1,\*)x,y,a,b,h,n

write(2,\*)"f(x,y)=(y-x)/(y+x)"

write(2,\*)"x=",x

write(2,\*)"y=",y

write(2,\*)"a=",a

write(2,\*)"b=",b

write(2,\*)"h=",h

write(2,\*)"n=",n

write(2,\*)" "

write(2,\*)" "

yy=y

write(2,\*)"Answer: "

write(2,\*)" "

do 100 i=1,n

k1=h\*f(x,yy)

k2=h\*f(x+h/2,yy+k1/2)

write(2,\*)"k1=",k1," k2=",k2

k3=h\*f(x+h/2,yy+k2/2)

k4=h\*f(x+h,yy+k3)

write(2,\*)"k3=",k3," k4=",k4

x=x+h

yy=yy+((k1+2.0\*k2+2.0\*k3+k4)/6)

write(2,\*)"x=",x," y=",yy

write(2,\*)" "

100 continue

stop

end

INPUT FILE

0

1

0

1

0.2

5

OUTPUT FILE

f(x,y)=(y-x)/(y+x)

x= 0.00000000

y= 1.00000000

a= 0.00000000

b= 1.00000000

h= 0.200000003

n= 5

Answer:

k1= 0.200000003 k2= 0.166666672

k3= 0.166197181 k4= 0.141443297

x= 0.200000003 y= 1.16786182

k1= 0.141514555 k2= 0.122007988

k3= 0.121510446 k4= 0.105290264

x= 0.400000006 y= 1.29016876

k1= 0.105334900 k2= 9.14716348E-02

k3= 9.10618752E-02 k4= 7.88631663E-02

x= 0.600000024 y= 1.38171291

k1= 7.88926482E-02 k2= 6.79967105E-02

k3= 6.76568002E-02 k4= 5.77379242E-02

x= 0.800000012 y= 1.44970250

k1= 5.77589683E-02 k2= 4.86493185E-02

k3= 4.83589359E-02 k4= 3.98758352E-02

x= 1.00000000 y= 1.49831104