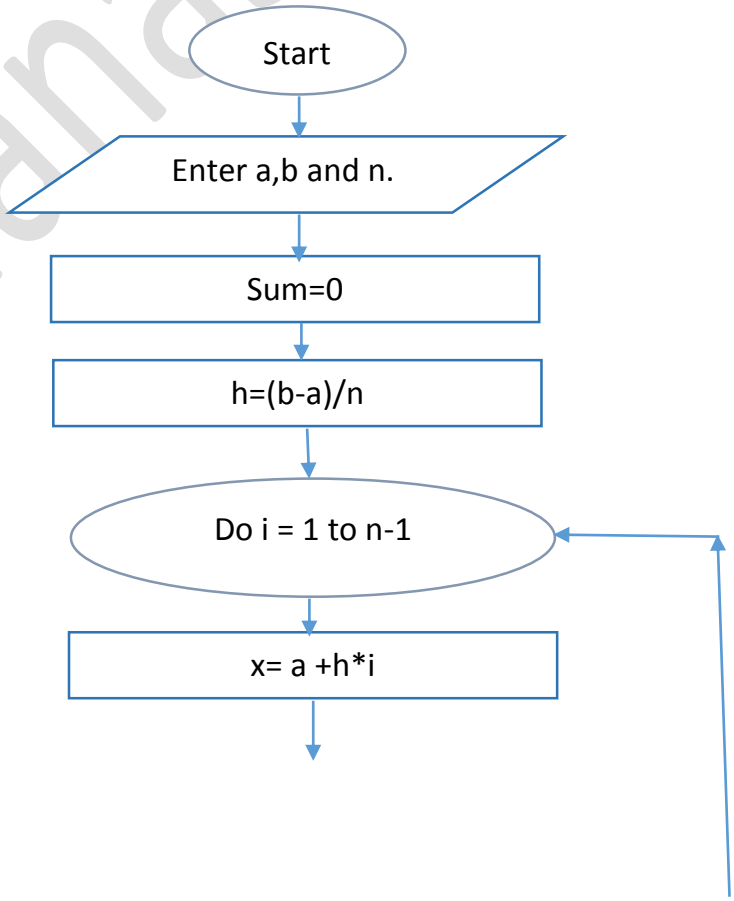
Aim: To evaluate a definite integral by Simpson's 3/8 Rule

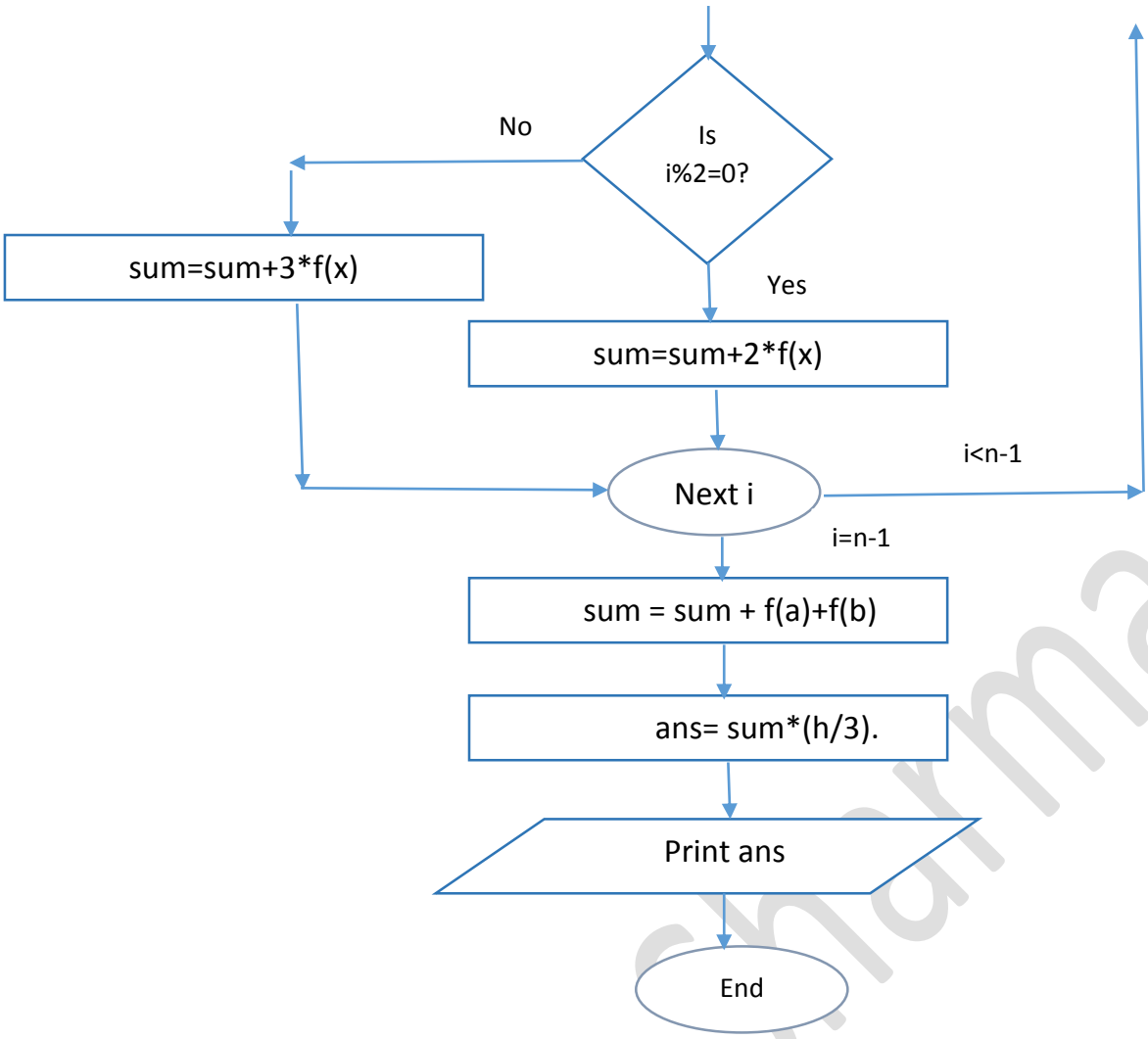
Algorithm:

1. Given a function f(x):
2. (Get user inputs)
   Input
      a,b=endpoints of interval
        n=number of intervals(Even)
   (Do the integration)
3. Set h= (b-a)/n.
4. Set sum=0.
5. Begin For i= 1 to n -1
      Set x =a + h*i.
      If i%3=0
         Then Set sum=sum+2*f(x)
      Else
         Set sum=sum+3*f(x)
   End For
6. Set sum = sum + f(a)+f(b)
7. Set ans = sum*(3h/8).
8. End

Flow Chart:



Manas Sharma



Manas Sharma

Program:

```
//Simpson's 3/8th Rule for Evaluation of Definite Integrals
#include<iostream>
#include<cmath>
using namespace std;
double f(double x)
{
   double a=1/(1+x*x);    //write the function whose definite integral is to be calcuated here
   return a;
}
int main()
{   cout.precision(4);        //set the precision
   cout.setf(ios::fixed);
   int n,i;            //n is for subintervals and i is for loop
   double a,b,c,h,sum=0,integral;
   cout<<"\nEnter the limits of integration,\n\nInitial limit,a= ";
   cin>>a;
   cout<<"\nFinal limit, b=";                //get the limits of integration
   cin>>b;
   cout<<"\nEnter the no. of subintervals(IT SHOULD BE A MULTIPLE OF 3), \nn=";        //get the no. of
subintervals
```

```
    cin>>n;
    double x[n+1],y[n+1];
    h=(b-a)/n;                    //get the width of the subintervals
    for (i=0;i<n+1;i++)
    {                    //loop to evaluate x0,...xn and y0,...yn
        x[i]=a+i*h;              //and store them in arrays
        y[i]=f(x[i]);
    }
    for (i=1;i<n;i++)
    {
        if (i%3==0)
        sum=sum+2*y[i];
        else
        sum=sum+3*y[i];
    }
    integral=3*h/8*(y[0]+y[n]+sum);    //3h/8*[y0+yn+3*(y1+y2+y4+...)+2*(y3+y6+y9+...+)]
    cout<<"\nThe definite integral  is "<<integral<<"\n"<<endl;
    return 0;
}
```

Output:

For f(x)= 1/ (1+x^2):

```
Enter the limits of integration,

Initial limit,a= 0

Final limit, b=6

Enter the no. of subintervals(IT SHOULD BE A MULTIPLE OF 3),
n=24

The definite integral  is 1.4056
```

For f(x) =x^3:

```
Enter the limits of integration,

Initial limit,a= 0

Final limit, b=6

Enter the no. of subintervals(IT SHOULD BE A MULTIPLE OF 3),
n=3

The definite integral  is 324.0000
```