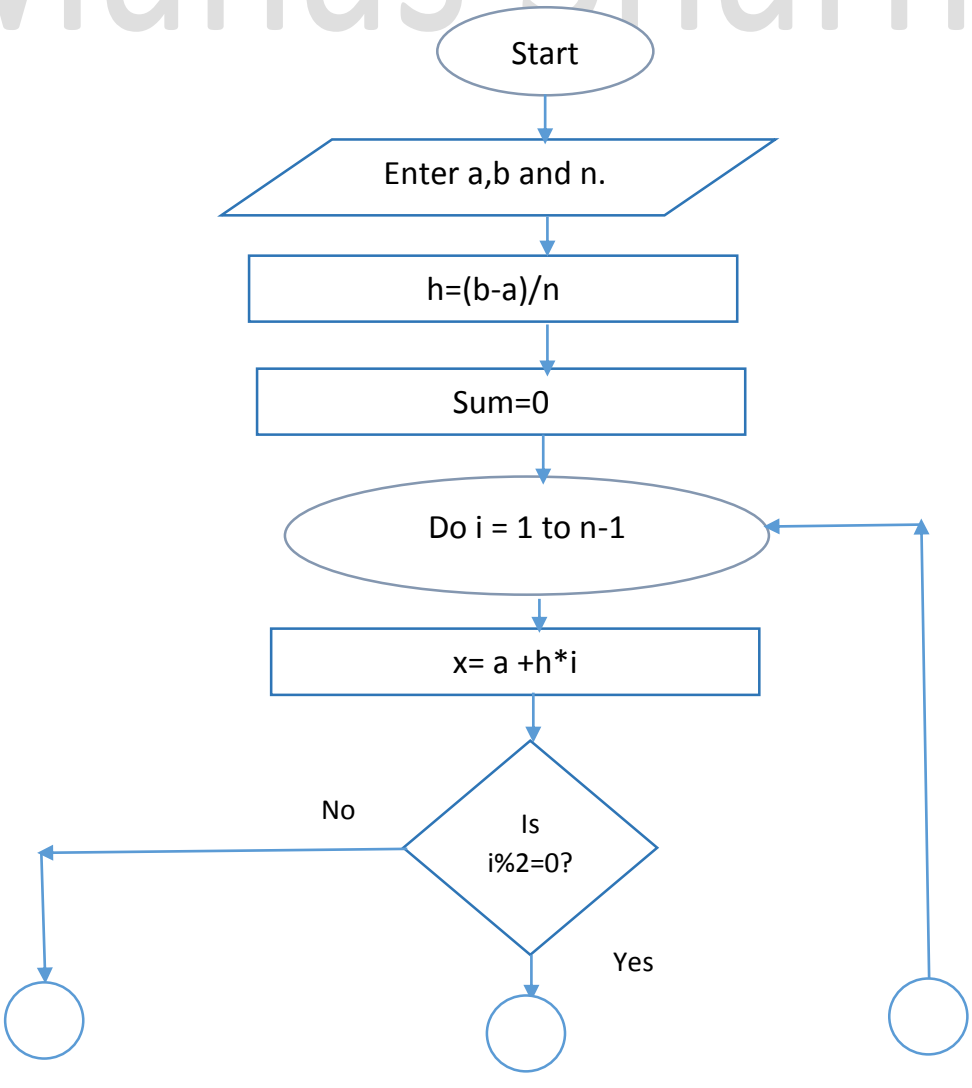
**Aim**: To evaluate a definite integral by Simpson's 1/3 Rule

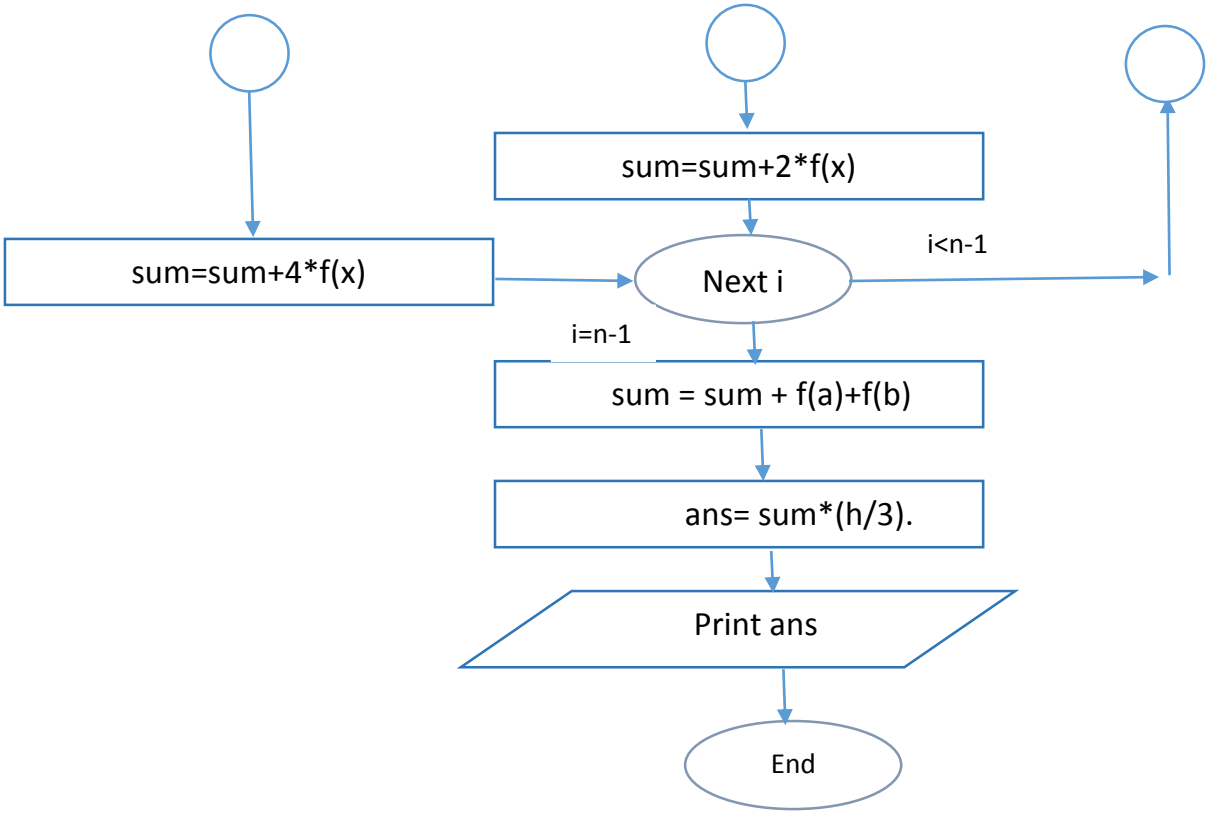
**Algorithm**:

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%2=0
   Then Set sum=sum+2*f(x)
   Else
   Set sum=sum+4*f(x)
   End For
6. Set sum = sum + f(a)+f(b)
7. Set ans = sum*(h/3).
8. End



**Flow Chart**:






**Program**:

```
//Simpson's 1/3rd 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 EVEN), \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+=2)
   {
      sum=sum+4.0*y[i];               //loop to evaluate 4*(y1+y3+y5+...+yn-1)
   }
```

```
    for (i=2;i<n-1;i+=2)
    {
       sum=sum+2.0*y[i];              /*loop to evaluate 4*(y1+y3+y5+...+yn-1)+
                                  2*(y2+y4+y6+...+yn-2)*/
    }
    integral=h/3.0*(y[0]+y[n]+sum);    //h/3*[y0+yn+4*(y1+y3+y5+...+yn-1)+2*(y2+y4+y6+...+yn-2)]
    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 EVEN),
n=8

The definite integral  is 1.3905
```

```
Enter the limits of integration,

Initial limit,a= 0

Final limit, b=6

Enter the no. of subintervals(IT SHOULD BE EVEN),
n=18

The definite integral  is 1.4056
```

For f(x)= x^2:

```
Enter the limits of integration,

Initial limit,a= 0

Final limit, b=3

Enter the no. of subintervals(IT SHOULD BE EVEN),
n=2

The definite integral  is 9.0000
```