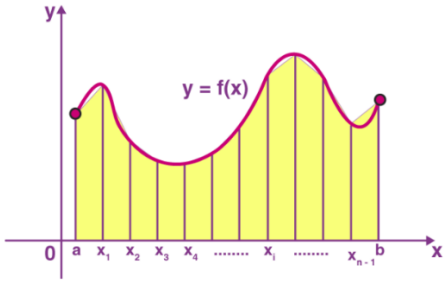
Lap 1 – Trapezoidal rule

A technique for approximating the definite integral.

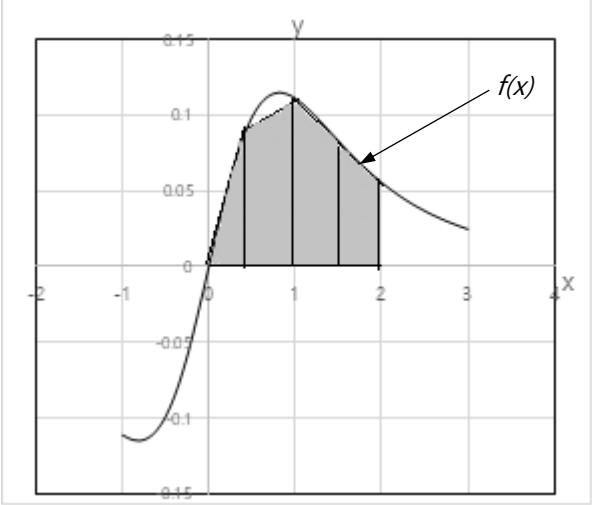


$$\sum_{i=0}^{N-1} \frac{1}{2}(f(x_i) + f(x_{i+1}))(\frac{b-a}{N})$$

Program:
```
sum = 0.0;
dx = (b-a)/N;

x = a;
for (i=0; i<N; i++) {
   sum += 1/2 * (f(x) + f(x+dx))* dx;
   x += dx;
}
```

(1) Write a C program(area.c) to calculate an area given by f(x)=$\frac{x}{(x^2+2)^3}$ where the range of x is from 0.0 to 2.0. (Use long and double for variables.)



The number of segments(N) must be provided by the command line argument. For your test, use N < 1000000.

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>

main(int argc, char *argv[])
{
long N;

if (argc != 2) {
    printf("argument error₩n");
    exit(1);
}
N = atol(argv[1]);
```

Theoretical calculation: Let z = x^2+2 then dz = 2x dx

$$\therefore \int_0^2 \frac{x}{(x^2+2)^3}dx = \int_2^6 \frac{1}{2z^3}dz$$

$$= -\frac{1}{4}\left[\frac{1}{z^2}\right]_2^6 = -\frac{1}{4}\left(\frac{1}{36}-\frac{1}{4}\right) = \frac{1}{18} \quad =0.05555\ldots$$

(2) Submit your program when you are done - ***submit area.c*** .