152112011 Computer Programming LAB

LAB WORK 1

8 March 2022

Objectives:

- Review of Introduction to Programming Course

- Start → Programs → Microsoft Visual Studio
- File → New → Project
- Select Visual C++ → Empty Project and write project name **Lab01** at bottom.
- In Solution Explorer right click Source Files folder → Add → New Item
- Select C++ File (.cpp) and give name **EX1.cpp** at bottom.
- Add a new item to this project such as **EX1.cpp, EX2.cpp**, etc.. for each of the following programs for today's lab work. **Do not forget exclude previous example**.
- Right click file (EX1.cpp) and select Exclude from project.

1. The constant ***e***, which is the base of natural logarithms, is given to 41 significant figures by ***e= 2.71828182845904523536028747135266249775 72.*** Define $x_n = \left(1+\frac{1}{n}\right)^n$ for n=1,2,... It can be shown mathematically that $x_n \to e$ as $n \to \infty$. Write a program calculate e values for user enter the n values.
(Hint: $x^y = pow(x, y)$)

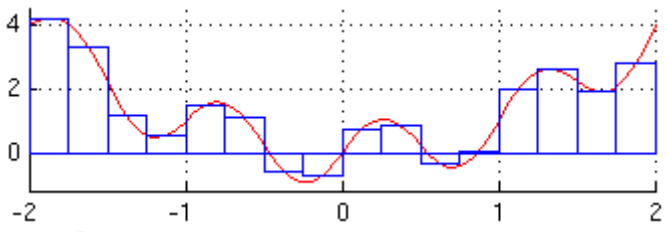
2. The basic problem considered by numerical integration is to compute an approximate solution to a definite integral:

$$\int_a^b f(x)\,dx.$$

A large class of quadrature rules can be derived by constructing interpolating functions which are easy to integrate. Typically these interpolating functions are polynomials.The simplest method of this type is to let the interpolating function be a constant function (a polynomial of degree zero) which passes through the point ((*a*+*b*)/2, *f*((*a*+*b*)/2)). This is called the *midpoint rule* or *rectangle rule*.

$$\int_a^b f(x)\,dx \approx (b-a)\,f\left(\frac{a+b}{2}\right).$$

We can make a more accurate approximation by breaking up the interval [*a*, *b*] into some number *n* of subintervals, computing an approximation for each subinterval, then adding up all the results



Write a program that calculates $\int_{x=-3}^{x=5} 3x^2 + 2x + 5\,dx$

Optional

Question 1:

- ✓ Define the arrays A, B, and C with five elements in each. There will be no array definitions other than these.
- ✓ Fill in the A and B array with the values you received from the user.
- ✓ Implement the B array to keep the values in reverse (A new array will not be created or used at this step).
- ✓ Fill array C so that it contains the sum of the elements in the same index in arrays A and B.
- ✓ Sample:

  Step-1 : A(1,3,6,3,8) B(8,3,5,2,7)
  Step-2: A(1,3,6,3,8) B(7,2,5,3,8)
  Step-3 : A(1,3,6,3,8) B(7,2,5,3,8) C(8.5,11,6,16)

Question 2:

- ✓ Construct an array A with 50 random values between (0.100). Make this assignment automatically random.
- ✓ Print numbers that exactly divides the number entered by the user.
- ✓ Print numbers that give a remainder of 7 when divided by the number entered by the user.
- ✓ **Bonus**: Compare the individual elements of array A with the number entered by the user. If they are prime numbers among themselves, print these two values.
- ✓ Sample:
- ✓ The number entered by the user: 14

  Likely numbers that exactly divides the number entered by the user: 14,28,42…
  Likely numbers that give a remainder of 7 when divided by the number entered by the user: 7,21,49…
  Bonus:
  The number entered by the user: 14
  Possible output:
  (14,3) are prime among themselves.
  (14,25) are prime among themselves.
  (14,39) are prime among themselves.