

Lab17

Currently laboratory work which includes expression:

$$\arctan(x) \simeq \frac{x}{\sqrt{1+x^2}} \cdot \sum_{k=0}^{500} \frac{(2 \cdot k)!}{(k!)^2 \cdot 4^k \cdot (2 \cdot k + 1)} \cdot \left(\frac{x^2}{1+x^2}\right)^k, \text{ kur } -\infty < x < \infty$$

calculates successfully within Taylor's method by previously set commands. Program includes integrated, unchangeable graphical ASCII interface which shows expression and recurrence factor. Recurrence factor was calculated, after written in the code.

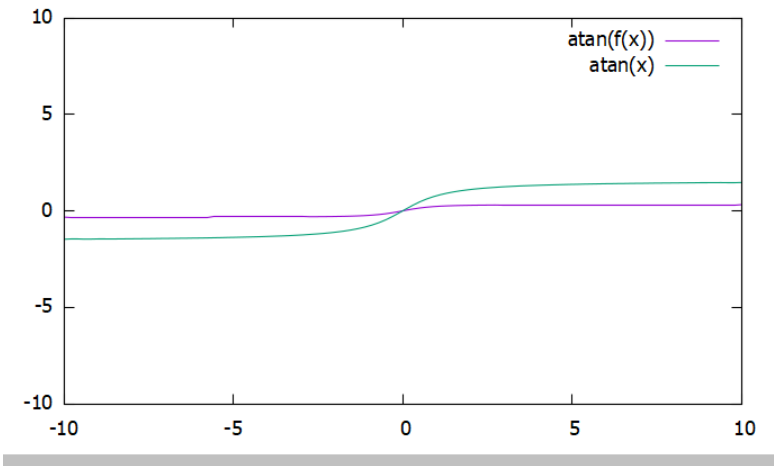
As *Taylor series* can be repeated multiple times, the user can choose the amount of cycles by adjusting the value to the variable *rep*.

Gnuplot's image:

Graphic representation of the equation was made with the application *Gnuplot*. Where *atan(f(x))* is purple line, *atan(x)* is green line and *f(x) = x / (3 * sqrt(1 + x*x))*.

Code of the solution:

```
set xrange [-10:10]
set yrange [-10:10]
f(x) = x/ (3 * sqrt(1 + x*x))
plot atan(f(x)), atan(x)
```



```
Enter value of x where f(x) = arcta(x)
2
arctan x = 1.107149
Enter amount of cycles
6
2.00      0.30      0.30
2.00      0.12      0.42
2.00      0.04      0.46
2.00      0.02      0.48
2.00      0.01      0.49
2.00      0.01      0.50
2.00      0.00      0.50
y = equation(2.000000) = 0.502532
```

Output of the program where x = 2.

← result of the Gnuplot's code.

Links:

https://github.com/Ontolf/RTR-105/blob/main/LabWorks/1lw_series/Lab17_main.c

Written:

A.Sergeev_____

Checked and graded:

Lector T.Solovjova_____