

19. nodarbība / Lesson 19

Datormācība
(pamatkurss)

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Nodarbības

19. nodarbība / Lesson 19

- ▶ Skaitliskās metodes / Numerical methods
 - ▶ Skaitliskā diferenciācija^a / Numerical differentiation
- ▶ Uzdevumu risināšana / Problem solving

Klātienē tiek iesākts (un mājās tiek pabeigts) 3. laboratorijas darbs - Darbs ar GitHub repozitoriju ([darbi/3ld_derivative/README.md](#) aizpildīšana - Skaitliskās metodes - Skaitliskā diferenciācija)

On-site lab work begins (and completes at home) Laboratory work Nr.3. - Working with the GitHub repository (report must be placed in [works/3lw_derivative/README.md](#) - Numerical methods - Numerical differentiation)

^aJ.Ziemelis. Ievads algoritmu valodā C. 2006.g. RTU, Rīga. - 47.lpp.

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Skaitliskās metodes - Skaitliskā diferencēšana - teorija

Numerical methods - Numerical differentiation - theory

$$f'(x) = \lim_{\Delta x \rightarrow 0} \frac{\Delta f}{\Delta x}$$

$$\Delta f = f(x + \Delta x) - f(x)$$

$$\Delta f = f(x) - f(x - \Delta x)$$

$$\Delta f = f\left(x + \frac{\Delta x}{2}\right) - f\left(x - \frac{\Delta x}{2}\right)$$

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Skaitliskās metodes - Skaitliskā diferenciācija - kods

Numerical methods - Numerical differentiation - code

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```
1 #include<stdio.h>
2 #include<math.h>
3
4 void main(){
5     float a=0.,b=2*M_PI,x,delta_x=1.e-2;
6     //float y;
7     printf("\tx\t\tsin(x)\t\tsin\'(x)\n");
8     x = a;
9     while(x<b){
10        //y = sin(x);
11        printf("%10.2f\t%10.2f\t%10.2f\n",x,sin(x),(sin(x+delta_x)-sin(x))/delta_x);
12        ;
13        //printf("%10.2f\t%10.2f\n",x,y);
14        x += delta_x; //x = x + delta_x;
15    }
```

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Skaitliskās metodes - Skaitliskā diferenciācija - Gnuplot skripts

Numerical methods - Numerical differentiation - Gnuplot script

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```
set grid
plot [0:2*pi] sin(x)
replot [0:2*pi] cos(x) title "cos(x)"
replot "derivative.dat" every ::1 using 1:2 with lines title "cos'(x) (analytical formula)"
replot "derivative.dat" every ::1 using 1:3 with lines title "cos'(x) (finite difference)"
```


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3. laboratorijas darbs - Darbs ar GitHub repozitoriju (EN)

Laboratory work Nr.3. - Working with the GitHub repository (EN)

- ▶ If necessary, delete old local repository - `rm -rf RTR105`
- ▶ Download Your repository - `git clone https://github.com/login/RTR105`
- ▶ Enter the lab work folder - `cd RTR105/works/3lw_derivative`
- ▶ Write the program so that it calculates and displays:
 - ▶ dialogue with user for obtaining of value of a
 - ▶ dialogue with user for obtaining of value of b
 - ▶ dialogue with user for obtaining of value of precision
 - ▶ values of $f(x)$ for x between a and b (calculate, show and save in `derivative.dat` file)
 - ▶ values of $f'(x)$ for x between a and b (calculate, show and save in `derivative.dat` file; use analytical formula)
 - ▶ values of $f'(x)$ for x between a and b (calculate, show and save in `derivative.dat` file; use forward difference)
 - ▶ values of $f''(x)$ for x between a and b (calculate, show and save in `derivative.dat` file; use analytical formula)
 - ▶ values of $f''(x)$ for x between a and b (calculate, show and save in `derivative.dat` file; use forward difference)
- ▶ Upload to GitHub figure with all curves from `derivative.dat`^f
- ▶ Append report - `nano works/3lw_derivative/README.md`^{ghi}
- ▶ Save history - `history > history_yyyymmdd.txt`
- ▶ Upload repository - `/git-upload-yyyymmdd_hh_mm`

^fUse GNUPLOT - see Sakai -> Lessons -> Class 16

^gMake sure to add a link to the picture of Your function

^hexample of md file - outside view

i example of md file - inside view

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3. laboratorijas darbs - rezultāta piemērs

Laboratory work Nr.3. - example of result

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x	f(x)	f'(x)	f'(x)	f''(x)	f''(x)
		analytical formula	finite difference	analytical formula	finite difference
...
...
...