

## Partial differential equations 2021, computer demo 1

Solutions to the following exercises should be returned by 5.12 to the address jarkko.siltakoski@jyu.fi. The "demo" session 23.11 at 8:30 is used as an additional instruction session where you can get help to these exercises.

Remember: Previous commands obtained using "arrow up".

First, create a new directory to save the exercises. Start MATLAB and set 'current directory' as the directory you just created. Type to the MATLAB command prompt

```
>> diary demo11.txt
```

This will save everything that you type or otherwise appears on the command prompt to the file `demo11.txt`. Thus you will have notes when completing the report.

1. Type in MATLAB command prompt

```
>> edit fundsol.m
```

MATLAB's editor opens so that you can write M-file `fundsol.m`. Draw a picture of the fundamental solution to the heat equation using `mesh` in  $(x, t) \in [-4, 4] \times [0.1, 5]$ . You can execute the file by typing in the MATLAB command prompt

```
>> fundsol
```

Attach the picture and the code to your report. Useful command: `meshgrid`.

2. Using `contour`, draw heat balls (again with  $x \in \mathbb{R}$ ). Then draw another picture using `imagesc` instead of `contour`. Arrange the pictures side by side using `subplot`, save the image, and attach it as well as the code to your report.

3. Type in MATLAB command prompt

```
>> edit g.m
```

Create the function  $g$  in Example 6.4 of the lecture note in the file `g.m`. Hints: see logical expressions and `find`.

4. Using the function of the previous exercise draw the pictures at times  $t = \frac{1}{2}, t = 1, t = 2$  as in Example 6.4 in the lecture note. Again using `subplot` but the images at the top of each other and attach the pictures and the code to the report.
5. Same as the previous exercise, but with the example under the Reflection method in the lecture note, p52.
6. As the previous exercise but for `t=0:0.1:3` and using `for`-loop. Hint: put `pause` inside the loop in order to see something. Also use `axis` to fix the size of your figure. Only attach three sample pictures and the code to your report.