UNIVERSITY OF KHARTOUM, ENGINEERING

# Assignment 2

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## NOTES

This assignment is about Laplace's equation. This assignment should give you the sufficient knowledge of working with Laplace's equations.
And, please for your submission, do not send me you *.tex or *.lyx files! Compress all the assignment files in a file, name it assignment-i-index.zip where i is the assignment number, index is your index. You can not imagine how this would help me!

## 1 PROGRAMMING PROBLEMS

Sorry, but this week we do not have any programming assignment. Besides, brace yourself the real programming assignments are coming!

## 2 THEORETICAL PROBLEMS

These problems are about derivation. If you are not sure about your calculus, please go and refresh it before you proceed. To get the best out of this assignment, write the answer using a pen (or a pencil), before you write them in your PC.

### 2.1 Compute the derivative (or partial derivatives)for these functions

$$f_1(x) = sin^2(x^4) \tag{2.1}$$
$$f_2(x) = 0 \tag{2.2}$$
$$f_3(x, y, z) = \sin(x) + \cos(y) \tag{2.3}$$
$$\tag{2.4}$$

### 2.2 Verify whether or not each of these functions satisfy Laplace's equation

$$f_1(x) = 0 \tag{2.5}$$
$$f_2(x, y) = \sin(x) + \cos(x) \tag{2.6}$$
$$f_3(x, y, z) = \sin(x^2) - \cos(xy) + \sin(x) \tag{2.7}$$
$$f_4(x, y) = x^2 + y^2 - 2xy \tag{2.8}$$
$$f_5(x, y, z) = 2x + 2z - 2y \tag{2.9}$$
$$f_6(x, y) = e^{-2xy} - 2e^{2xy} \tag{2.10}$$

A good answer for this question is to come with a generalization about Laplace's equations. Because, you have basically tried it on different types of functions.

## 3 Collaboration

As we have said in the section, you are highly encouraged to work together, but you have to make sure that *all* of your submission is yours! We have very strict collaboration policy, so please make sure that you anything your submit is yours, and whenever you used someone's work you clearly indicate that (by citing them).
Another important thing, whenever you have collaborated with someone, please write down their names. Having done will save you from getting zero marks. There is no penalty of writing the names of people you have worked with them–they won't also get any credit for that–it's just for us to know that you have worked together. Again, working together does *not* mean giving someone's your code!
Another thing, we need to know the hours you have spent on working with each assignment, so that we can know exactly if it is too much (or too little!). Please provide correct answers, I mean we will give you any extra credits if you solve your assignment in one hour! It is just for us to make sure that we are not giving you too much.

**I've collaborated with:** .....
**Approximate hours for this assignment**:..... hours