MVE290 GOALS FOR 2020.01.20 SPECIAL K. 1

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The goal of today's class is simple:

> You will be able to classify every ODE and PDE in the universe.

Why might you want to do this? Know thy enemy. If you know what the ODE or PDE is *called* then you can search for information about it. If you don't know what it is called, what should you search for in Google? At this point in time, you cannot enter ODEs or PDEs into the Google search field and obtain any useful information. You need the words which are used to classify the equation, and that's what you will learn today.

1. Learning objectives

Our specific goals for today are:

(1) You will be able to recognize the difference between an ordinary differential equation (ODE) and a partial differential equation (PDE).
(2) You will be able to specify the order of the equation (also known as degree).
(3) You will be able to tell if the equation is linear or non-linear.
(4) For linear equations, you will be able to specify whether or not the equation has constant coefficients.
(5) You will be able to tell if the equation is homogeneous or inhomogeneous.
(6) You will be able to classify second order linear PDEs in two variables as either elliptic, parabolic, or hyperbolic.

If we have extra time (and it is likely we will), we may take this time to review and strengthen our agility with

(1) complex exponentials
(2) trigonometric functions
(3) hyperbolic trigonometric functions

These play a very important role in the main course, so it's important that you are comfortable with all of them and the relationships between them. So, for anyone who wishes a little refresher on these old friends, we may have time to do that. If so, the goal for that part will be:

> You are able to express trigonometric functions in terms of complex exponentials; express complex exponentials in terms of trig functions; and express hyperbolic trig functions in terms of exponential functions.