Partial Differential Equations
Homework 1 LaTeX example

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These are the things I will look for you to do in each of your typed problems:

- Give some context (introduction) to the problem you are solving and why you picked that one.
- Explain ALL of the logic behind the solution steps. I want to know WHY you think you should do the process you are doing. And the answer should be more than "Joanna said so".
- At the end, explain what you solution means and why it makes sense

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LaTeX is really great at typing up mathematics. It has a steep learning curve, but once you get the hang of it, it's amazing!!

Here is an example of how nice the Heat Equation looks in Latex:

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$$

Or how you could do a numbered equation:

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2} \tag{1}$$

Or you can type the equations or variables in the sentence. Here $u(x,t)$ measure the heat in an insulated rod and the equation modeling it is given by $u_t = u_{xx}$. And then reference them, like equation 1.

The solutions in this class will be MESSY... we are just going to have to get use to it.
For example, give the system:

$$PDE: \quad u_t = \alpha^2 u_{xx} \tag{2}$$

$$BCs: \quad u(0,t) = 0, \qquad 0 \le t < \infty$$

$$u(1,t) = 0 \tag{3}$$

$$IC: \quad u(x,0) = \phi(x), \qquad 0 \le x \le 1 \tag{4}$$

We would find the solution

$$u(x,t) = \sum_{n=1}^{\infty} A_n e^{-(n\pi\alpha)^2 t} \sin(n\pi x)$$

and then once we know the function $\phi(x)$ from the initial condition, equation 4, we would find the coefficients A_n that make the initial condition true. We can actually write these in general,

$$A_n = 2\int_0^1 \phi(x)\sin(n\pi x)\, dx$$

And this is a "nice" one!

Finally, sometimes you will want to plot your solutions or add some images to your document. I like XKCD comics!  But sometimes you want them to be big enough to read! See figure 1 below.

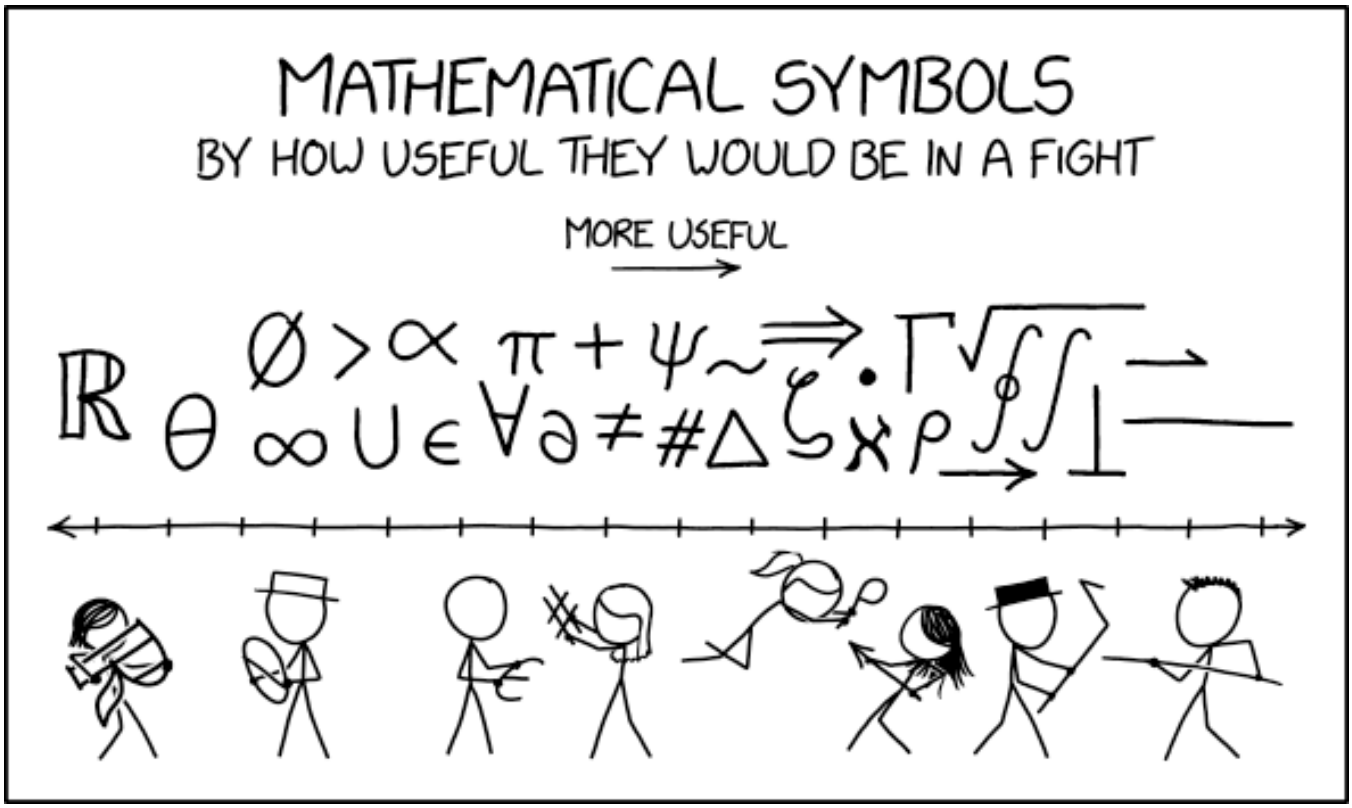

Figure 1: I would go to battle with ξ.