

First of all: the teacher is super nice and friendly. And everything that's on VOWI page for the VU is true. It really is important to understand ideas, plus the main formulas (I didn't have to write any of the more complicated formulas – i.e. for multistep algorithms for differential equations it was enough to just say what differentiates them from the one-step algorithms, I did not have to write the formula with alphas and betas).

I had two questions. The first one was like the one provided on TUWEL – she tells you “What can you tell me about non-linear equations and the Nullstellenproblem”. And the second one was about differential equations (I believe everyone who does the VO gets one question about that chapter).

For the first question, I mostly just talked. I explained the main ideas of Nullstellenproblem, Fixpunktproblem, Iterationsverfahren. Then she asked me when does an Iterationsverfahren converge (Lipschitzstetigkeit with  $L < 1$ ). She asked what other methods were there – the most famous one (Newton-Verfahren, which I explained graphically by sketching a function, its tangent, saying that the first abbreviation is actually the tangent, etc). I also wrote the Newton-Method function for 2D, and then she asked what if we had a matrix-function (then we would not simply divide by  $f'(x)$ , but multiply with  $(F'(x))^{-1}$ ). She then asked what  $x_0$  can we choose (the one that is near the null-point). She then asked if there is something we can do to expand this interval from which  $x_0$  converges (gedämpftes Newton-Verfahren mit  $\lambda$  aus  $(0,1]$ ).

She then asked if I could tell her basic ideas from chapter 6. I then stated that first we have the Picard-Lindelöf theorem (she said that I could just tell her what it says – probably that it states the conditions under which the solution exists and is unique – but I told her the theorem formally since I just happen to pay more attention to it than I probably needed yesterday night for some reason). I then explained graphically again the idea of Euler-Verfahren (look at the YT video below), and told her informally what the difference between the implicit and explicit version of it. Then she asked me to shortly tell the difference between the multistep and one-step algorithms.

And that was it! I got an AI. I have previously done the UE, but have not attended the lecture. Look below for my approach for this exam. It took about 15 minutes in total. She immediately entered the data in TISS, giving the Zeugnis on the same day.

My preparation: I have attended the lectures. Starting about a week from the exam, I have started reading the script, so that I really understand everything it is (rather than memorising everything). Then two days before the exam, I had just tried to revise and memorise as many ideas and formulas. I had also watched some YT videos for the topics that were not as nicely explained in the script (one of those things – the Euler method actually came up during the exam and I provided the explanation from the video). During these last two days of learning (so about 20h) I focused heavily on the Fragenkatalog (very useful in this last stage of learning!) and on the notes I made during my first reading of the script.

Videos that helped me a lot:

Gauß-Quadratierung (this guy is amazing, you really should watch all four videos):

0: <https://www.youtube.com/watch?v=k-yUdqRXijo>

1: <https://www.youtube.com/watch?v=65zwMgGZnUs>

2: [https://www.youtube.com/watch?v=nQZYBWB6q\\_k](https://www.youtube.com/watch?v=nQZYBWB6q_k)

3: <https://www.youtube.com/watch?v=cKkrGr93f6c>

Euler-Verfahren: <https://www.youtube.com/watch?v=q87L9R9v274>