

# This is a Very Important Title!

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This abstract is abstract.

If you want to learn more about using L<sup>A</sup>T<sub>E</sub>X, you should check UiO's official tutorials: <https://www.mn.uio.no/ifi/tjenester/it/hjelp/latex/>

If you are familiar with L<sup>A</sup>T<sub>E</sub>X and you want to learn more about the REVTeX4-1 document class, check: [http://www.physics.csbsju.edu/370/papers/Journal\\_Style\\_Manuals/auguide4-1.pdf](http://www.physics.csbsju.edu/370/papers/Journal_Style_Manuals/auguide4-1.pdf)

## I. INTRODUKSON

## II. TEORI

### A. Vet ikke om denne kan være med

I dette eksperimentet skal vi bruke Crank-Nicolson tilnærmingen. Denne kombinerer to andre tilnærminger: forover differanse og bakover differanse. Forover differanse baserer seg på å at man kan finne stigningen mellom et punkt  $u_i^n$  og neste punkt  $u_i^{n+1}$  ved ligningen

$$\frac{u_i^{n+1} - u_i^n}{\Delta t} = \frac{u_{i+1}^n - 2u_i^n + u_{i-1}^n}{(\Delta x)^2}$$

Vi ser her på kun i én dimensjon. Vi har også antatt at tidsstegene er så små at punktet  $u_i^n$  kun kan bli påvirket av nabopunktene. Da får vi at

$$u_i^{n+1} = u_i^n + (u_{i+1}^n - 2u_i^n + u_{i-1}^n) \frac{\Delta t}{(\Delta x)^2}$$

Hvis vi nå definerer  $\alpha \equiv \frac{\Delta t}{(\Delta x)^2}$  får vi at

$$u_i^{n+1} = (1 - 2\alpha)u_i^n + \alpha(u_{i+1}^n + u_{i-1}^n)$$

Så har vi bakover differanse som baserer seg på å finne stigningen mellom forrige tidspunkt  $u_i^{n-1}$  og det nåværende tidspunktet  $u_i^n$ .

$$\frac{u_i^n - u_i^{n-1}}{\Delta t} = \frac{u_{i+1}^n - 2u_i^n + u_{i-1}^n}{(\Delta x)^2}$$

og på samme måte som med forover får vi nå

$$u_i^{n-1} = (1 + 2\alpha)u_i^n - \alpha(u_{i+1}^n + u_{i-1}^n)$$

### B. Numerisk tillnærming

V har da fra Schrödingerlikningen at

$$i \frac{\delta u}{\delta t} = -\frac{\delta^2 u}{\delta x^2} - \frac{\delta^2 u}{\delta y^2} + v(x, y)$$

eller

$$\frac{\delta u}{\delta t} = i \frac{\delta^2 u}{\delta x^2} + i \frac{\delta^2 u}{\delta y^2} - iv(x, y)$$

Vi skal så bruke Crank-Nicolson tilnærming så vi starter med å approksimere den venstre-siden

$$\frac{du}{dt} = \frac{u_{i,j}^{n+1} - u_{i,j}^n}{\Delta t}$$

Hvor  $n$  er tidssteg vi er i. Crank-Nicolson baser seg på forover og bakover tilnærminger. For forover har vi at

$$\frac{u_{i,j}^{n+1} - u_{i,j}^n}{\Delta t} = F^n$$

mens bakover har vi

$$\frac{u_{i,j}^{n+1} - u_{i,j}^n}{\Delta t} = F^{n+1}$$

Så kombinerer vi disse forover og bakover

$$\frac{u_{i,j}^{n+1} - u_{i,j}^n}{\Delta t} = \theta F^{n+1} - (1 - \theta)F^n$$

slik at for  $\theta = 1$  har vi bakovertilnærmingen og for  $\theta = 0$  har vi forovertilnærmingen. For Crank-Nicolson setter vi  $\theta = \frac{1}{2}$  slik at vi får

$$\frac{u_{i,j}^{n+1} - u_{i,j}^n}{\Delta t} = \frac{1}{2}(F^{n+1} - F^n)$$

## III. METODE

## IV. RESULTATER

## V. DISKUSJON

## VI. KONKLUSJON

## ACKNOWLEDGMENTS

I would like thank myself for writing this beautiful document.

## REFERENCES

- Reference 1
- Reference 2

**Appendix A: Name of appendix**

This will be the body of the appendix.

**Appendix B: This is another appendix**

Tada.

Note that this document is written in the two-column format. If you want to display a large equation, a large

figure, or whatever, in one-column format, you can do this like so:

This text and this equation are both in one-column format.

[? ]

$$\frac{-\hbar^2}{2m}\nabla^2\Psi + V\Psi = i\hbar\frac{\partial}{\partial t}\Psi \quad (\text{B1})$$

Note that the equation numbering (this: B1) follows the appendix as this text is technically inside Appendix B. If you want a detailed listing of (almost) every available math command, check: <https://en.wikibooks.org/wiki/LaTeX/Mathematics>.

And now we're back to two-column format. It's really easy to switch between the two. It's recommended to keep the two-column format, because it is easier to read, it's not very cluttered, etc. Pro Tip: You should also get used to working with REVTeX because it is really helpful in FYS2150.

One last thing, this is a code listing:

```
This will be displayed with a cool programming font!
```

You can add extra arguments using optional parameters:

```
This will be displayed with a cool programming font!
```

You can also list code from a file using `lstinputlisting`. If you're interested, check [https://en.wikibooks.org/wiki/LaTeX/Source\\_Code\\_Listings](https://en.wikibooks.org/wiki/LaTeX/Source_Code_Listings).

This is a basic table:

Table I. This is a nice table

Hey	Hey	Hey
Hello	Hello	Hello
Bye	Bye	Bye

You can a detailed description of tables here: <https://en.wikibooks.org/wiki/LaTeX/Tables>.

I'm not going to delve into Tikz in any level detail, but here's a quick picture:

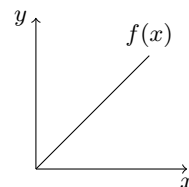


Figure 1. This is great caption

If you want to know more, check: <https://en.wikibooks.org/wiki/LaTeX/PGF/TikZ>.