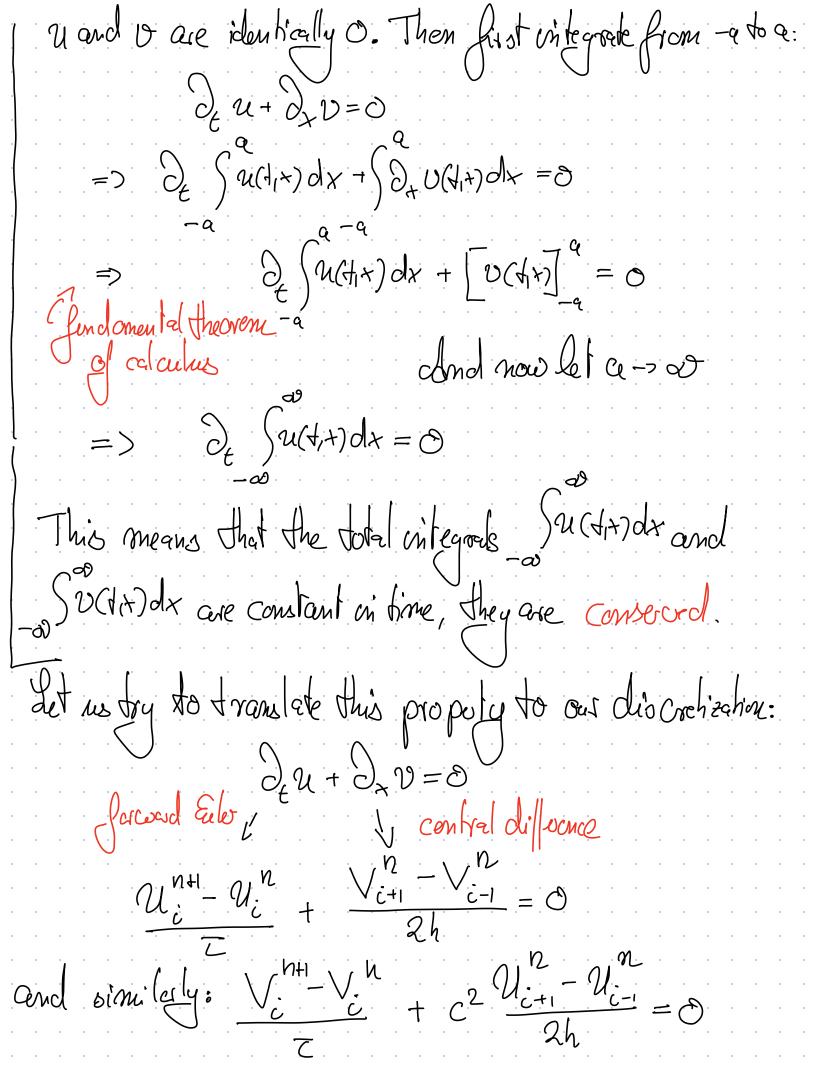
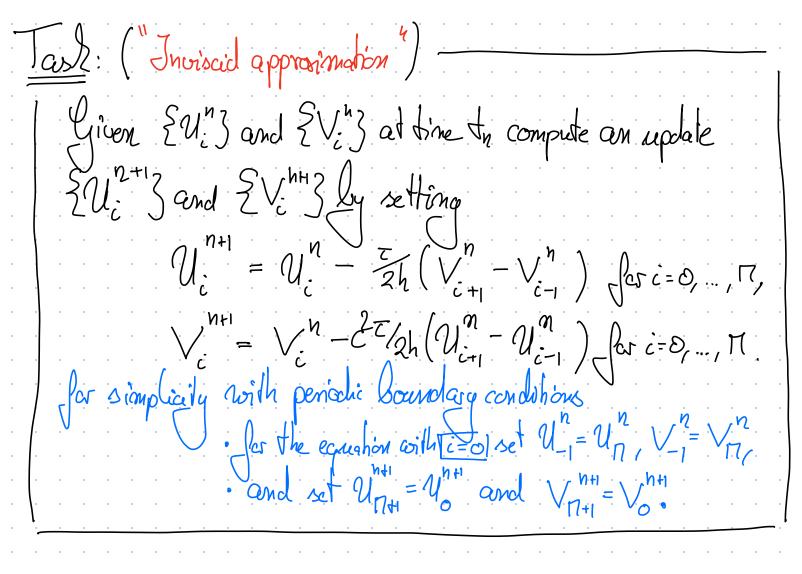


Diminary to what we did for the particle problem in the previous lecture we can again perform a van deumann sahilite and y sis, that will reveal that & is subject to a
previous lecture we can again person a von chemann sorbility
angysis, that will reveal That (8) is subject to a
The to be done what CTCh
That to be chosen such that CT <h. "hypobolic="" cfl="" condition"<="" td=""></h.>
But there is another issue with this approach. We need to
But there is another issue with this approach. We need to Show values for U, at him to and to in order to "start" the procedure.
Remark: This is typically avoided by removing the second fine derivative: Introduce $v(4+) = 2 u(4+)$ and approximate
tive denivolive: Introduce $v(44) = d_{\epsilon}u(44)$ and approximate
$\int_{C} \int_{C} u - v = 0$
$\begin{cases} \partial_{\epsilon} u - v = 0, \\ \partial_{\epsilon} v - c \partial_{\chi} u = 0, \end{cases}$
instead.
Ritornal de de la litteratura
But we will now try something slightly different instead: "The wave equation in conseverive form"
imalegal: 1 1

Let us introduce a function $v(t_i \times)$ by setting $\partial_t v = -c^2 \partial_x u$ cond substituting into the wave equation: $O = \partial_{\varepsilon}^{2} u - c^{2} \partial_{x}^{2} u$ substituting $t = \frac{\partial^2 u}{\partial t} + \frac{\partial u}{\partial t} + \frac{\partial u}{\partial t}$ $= \frac{\partial^2 u}{\partial t} + \frac{\partial u$ (with initial condition $u(t_0,) = u_0(.)$ and $v(t_0,) = v_0(.)$. Komark: Why is this a "conservation equation"? Suppose u(t,x) and v(t,x) are given on the enhine real number line, x & Z=R. But les away from the origin





Technicality: Flow to entry role point values? John:

Su(think) dx (2) 2 h Vi =: I (Un)

a periodic, No - Un

Trapezoidal rule

Observation: The scheme is conservative, one ming $I(u^{n+1}) = I(u^n) \text{ and } I(V^{n+1}) = I(V^n)$

From:
$$I(\mathcal{U}^{nH}) = \sum_{i=0}^{M} h \mathcal{U}_{i}^{nH}$$

$$= \sum_{i=0}^{M} h \mathcal{U}_{i}^{n} - \sum_{2h} \left(\mathcal{V}_{i+1}^{n} - \mathcal{V}_{i-1}^{n} \right) \right)$$

$$= \sum_{i=0}^{M} h \mathcal{U}_{i}^{n} - \sum_{2h} \left\{ \sum_{i=0}^{M} \mathcal{V}_{i+1}^{n} - \sum_{i=0}^{M} \mathcal{V}_{i-1}^{n} \right\}$$

$$= \sum_{i=0}^{M} h \mathcal{U}_{i}^{n} - \sum_{i=0}^{M} \left\{ \sum_{i=0}^{M} \mathcal{V}_{i+1}^{n} - \sum_{i=0}^{M} \mathcal{V}_{i}^{n} \right\}$$

$$= \sum_{i=0}^{M} \mathcal{U}_{i}^{n} - \sum_{i=0}^{M} \left\{ \sum_{i=0}^{M} \mathcal{V}_{i+1}^{n} - \sum_{i=0}^{M} \mathcal{V}_{i}^{n} \right\}$$

$$= \sum_{i=0}^{M} \mathcal{U}_{i}^{n} - \sum_{i=0}^{M} \left\{ \sum_{i=0}^{M} \mathcal{V}_{i+1}^{n} - \sum_{i=0}^{M} \mathcal{V}_{i}^{n} \right\}$$

$$= \sum_{i=0}^{M} \mathcal{U}_{i}^{n} - \sum_{i=0}^{M} \mathcal{V}_{i+1}^{n} - \sum_{i=0}^{M} \mathcal{V}_{i}^{n} - \sum_{i=0}^{M} \mathcal{V}_{i+1}^{n} - \sum_{i=0}^{M} \mathcal{V}_{i}^{n} - \sum_{i=0}^$$