Let's start unto a simple test problem. For this problem we should derive at least one difference quotient for the second derivative.

$$E_{x} = u''(\bar{x}) = \frac{u(\bar{x}) + u(\bar{x}) + u(\bar{x} + h)}{h^{2}} + \frac{e_{1x_{0}}}{O(h^{2})}$$

$$|u''(z)| - \frac{1}{h^2} \left\{ (u(z) + h u(z) + \frac{h^2}{h^2} u''(z) + \frac{h^2}{h^2} u'''(z) + \frac{h^2}{h^2} u''''(z) + \frac{h^2}{h^2} u''''(z$$

= 0(h*)

Now, leté head note the problems we fan.

Hent Equation:

4 (x,+) = Kuxx(x,+) + 4 (x,+)

and we will unjouse until condition of the form $U(x,0) = U_0(x)$

with boundary condition $u(u,t)-d, \ u(L_14)=\beta$

The idea in that in many problems we will see a transact between the system will be expected to evoke vite a steely.

Shot or equilibrium. The would enjely

for u-uco). So he ran write

who fixed to the time. The Bes can be transleted to

Thu is a 2pt 1941?

Now, suppose we want to approximate the solution of descrete points in the domain of U. The inseres we will look for values $W_0, W_1, \dots, W_m, W_{min}$ when $U_j \approx u(r_j)$, when have

- 1. Ky jeh
- 2. h: /mai)
- 3 thood, there ? we the solution is effect on the

Un rom substitute

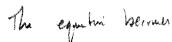
4 0° Vij to (19-1-24 + Vijn)

$$Je1, \qquad U_0 \cdot X \\ H' \qquad \qquad = f(x)$$

We will resument the meetric form for these

Or, we can elimate it's and I'm+1 Since they are lemm. If we set

Hun





what we want to do is figure out how much error exists. Like lenow that approximately errors in w" by D' makes some error and we know to an elyze that will Taylor some. This is more complicated that whilms here done

Suppose un defini

Then defor

The what will be the measure. We use |E| before but this was

1.
$$||E||_{\infty} = \max_{1 \leq j \leq m} |E_j| = \max_{1 \leq j \leq m} ||T_j - u(v_j)|| = \infty - norm or sup norm$$

If any of these is smell, they will all be small.

Appendix A.

Eyvers in vectors will be nour for berten

Def. A vector norm for VERM is a function IIVIIEIR when

- 1. IIxII 7.0 for any XFIRM and IIxII=0 iff X=0.
- 2. It a is any seeder (number), then Max 11 = 121 /1x/1
- 3 If x and y are vectors, then 1x+y11 < 11×11+ 11911.

The definition we will use are given above.

Important: Nova Equivalin

Owstan': Suppose me hom Herrorll & Ch?

in one norm. Can we find a different norm that gives a different makes

Norms definish on any vector space that is finite dimensional and equivelent. So for 11x11a and 11x16 on the same vector space there exist Constants & and & such that

(1 11x11a & 11x11, 5 & 11x2 11

For me can be well me

Helmille & Calle (m) II a & Cache = O(nº)

where sys or much width

Ervois in Function: White ale

1. 11ell, = | leixilde 3. 11ellz = (| leixilde) 2. 11ella = marchen | 4. 11ella = (| leixilde) 3. 11ella = (| leixilde)