Name: Mangesh Balvi ROLL NO: 112001010. Partial Differencial Equations and finding roots. * PPF is an equation involving one or more derivative of unknown function if all derivative are taken with respect to several independent Heat equation, Alere, et is coefficient of termal diffusivity. * Boundary value problem:-Differencial equations is an open multidiamentional region replay for which the value of unknown solo is prescribed on boundary 20 of multidiamenticnal region, example, quent el 2º m(xxt) fort) with initial conditions . M(X10)=g(X) XX ∈ [916] and boundary equation, the neart) = u(b,t)=0, throw

Approximation by finite dibberences:
let, quexit) = u(x+h/2,t) - u(x-h/2,t)

h Then, we have, 22 mixit) = 3(x+\frac{1}{2},t) - 3(x-\frac{1}{2},t) ~ ucx+bit)_zucxit)
~ tu(x-bit) Let, partition interval [9,6] into $J_j = [x_i, x_{j+1}]$ of length h for j = 0,1,...,N with $x_0 = 9$, $x_N = b$ let, uj(t) denotes approximation of $u(x_j,t)$. je so, ..., N), Then Ytro, we should have

ties 1, 2, ..., N-1?

duict u (uj. (t) - 2 uj(t) + uj, (t)) = sj(t)

with initial condition u.(t) = 0 and un(t) = 0,

fi(t) = 0 f(xi, t) and uj(0) = g(xj)

giving us following ode,

dult u Au(t) + f(t) with

dt h2

Egure out approximations for 22 u(xit) and

9. * Figure out approximations for 22 u(xt) and 22 u(xt) and 30/ve on E. 3x12

22 = W(i+1,i) - 2 u(i,j) + u(i-1,j) 2x2 = 0x12

224 = 47 = 4(x+h) - 2 f(x,y) + f(x-h,y)

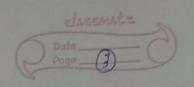
 $\frac{\partial^{2}u}{\partial x_{1}^{2}} = \frac{u(x+k) - 2f(x,t) + f(x-k,t)}{u(x+k) - 2f(x,t) + f(x-k,t)}$

1 2 4 2 [u(x+h) + f(x-h,t)]

Assumming we have system of ODF, $\frac{\partial^2 u(x)}{\partial x_1^2} = F_1(x_1, x_2, t)$

22 u(xit) F2 (X1, X2, t).

we need more info. like form of F, F2 and boundry condito solve.



Root- Finding Algorithms:

In mothernatics and computing , root binding algorithm is an algorithm for trinding zeros also called roots of continous function.

zero function of function f. R->R is number & S-1. f(x)-0.

most algorithms (root finding) do not govarantee they then that they will find all the roots; in perficular if such an algorithm does not find any root, that does not mean root not

Bisection method! -

An approximation method to finds note of given equation repeatedly dividing the intervals. His method usu'll divide interval until resulting interval is tound which is extremely small.

f, a, b, TOL, NMAX.

either feat < f(b) - or

either fca) (o and f(b) 70 or f(a) 70 and

value which dibbers from a root of FCX) = 0 by less than TOI. output:

Nel

NS NMAX do While

if fcc) = 0 01 (b-a)12 < Tol Then
output (c); stop

stop



end if if sgn(f(a)) = sgn(f(a)) then

a < c else b < c. end while; output " Method failed". * the no number n of iterations preded to achieve a required tolerance E is bounded by $n \leq n_{12} = \lceil \log_{2} \left(\frac{\varepsilon}{\varepsilon} \right) \rceil$ where Es = 16-a of Newton - Raphson method, Consider a differencial equation function, f: IR -> IR if f satisfies cufficient assumptions and initial guers xo is close. Took can be found using following iterative method, XK+1 = XK - f(XK) -> must be continous in said -> must be dibberencial in case], derivative f'(x) much exist and should be continue > & f'(x) + 0 s initial guess xo must be close to root of function.

if f: RK > RK, multivariate vector-value function,
iteration is given by XK+1 = XK = J(XK) F(XK)
Where J(XK) is Jacobian Matrix of F