Boundary Value Problem (Finite Difference Method)

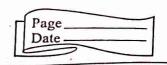
Lab Report for Assignment No. 11

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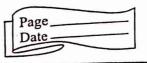
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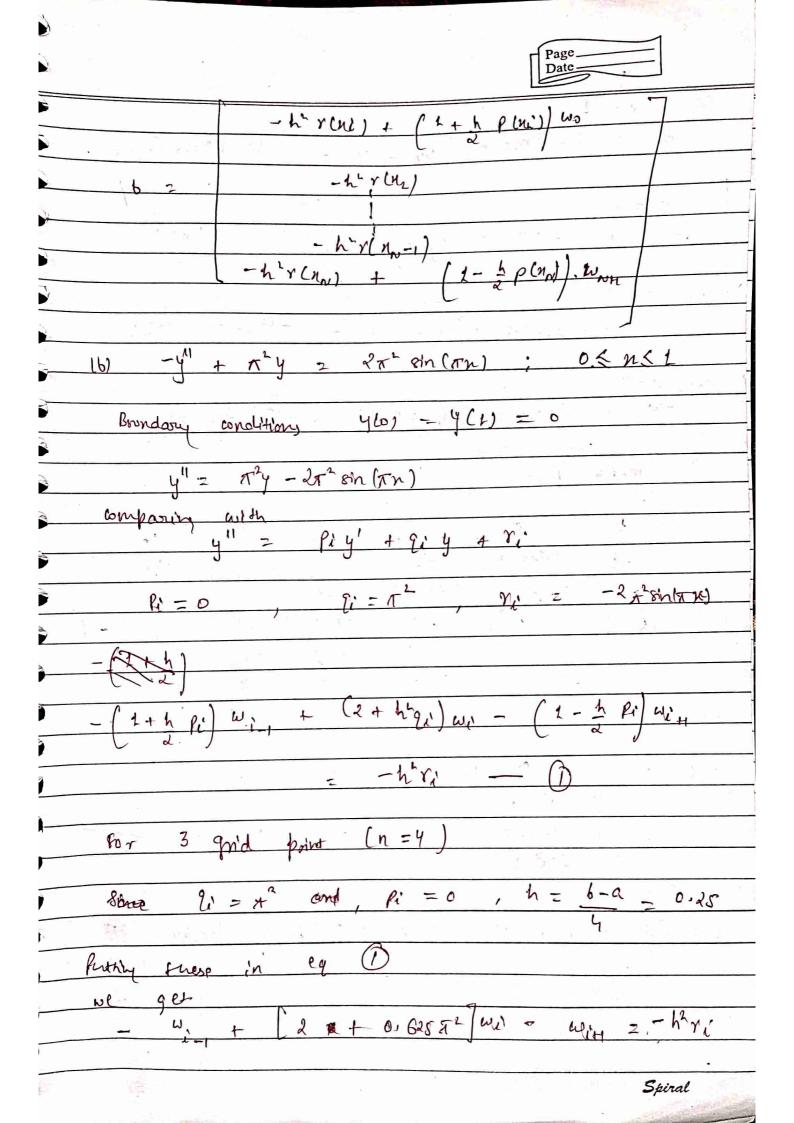
and the same of th
(a) The finite difference method for the linear
seemed - proter BVP
$y'' = \rho(n)y' + g(n)y + g(n)$
for a sax b with year = d and year = B
first we divide the intered [9,67 ins (N+2)
equal subintervals whose end points are three
much points
$\mathcal{H}_{i} = Q + ih \qquad \text{for} \qquad i = D, 1 \dots - N+L$
where $h = b - a$ (step & ze)
(1941)
At the intervor meth points is for 1 = 1, 2 N
4"(7)
$y''(x_i) = \rho(x_i) y'(x_i) + \rho(x_i) (x_i) + \gamma(x_i)$
Expanding 4 in a third Taylor Polynmial about
Expanding y in a third Taylor Polynmial about hi evaluated out "it and "i'-1.
yonin = youth) = you') + hy'(ni) + hhy'(ni)
+ h's g'"(ui) + h y4)(&i+)
6 24 <u> </u>
for some fine (ni, nity)
$\frac{y(n-1)}{y(n-1)} = y(n-1) - y(n-1) - hy'(n-1) + h' y'(n-1)$
1.
- h³ y"(eu) + h y(9) (\xi) - 2)
for some \(\frac{\pi_1}{2}\) for in \(\lambda_{1-1}\), \(\frac{\pi_2}{2}\) \(\frac{\pi_1}{2}\)
7/ M (n - 1-1/1) 1 14/



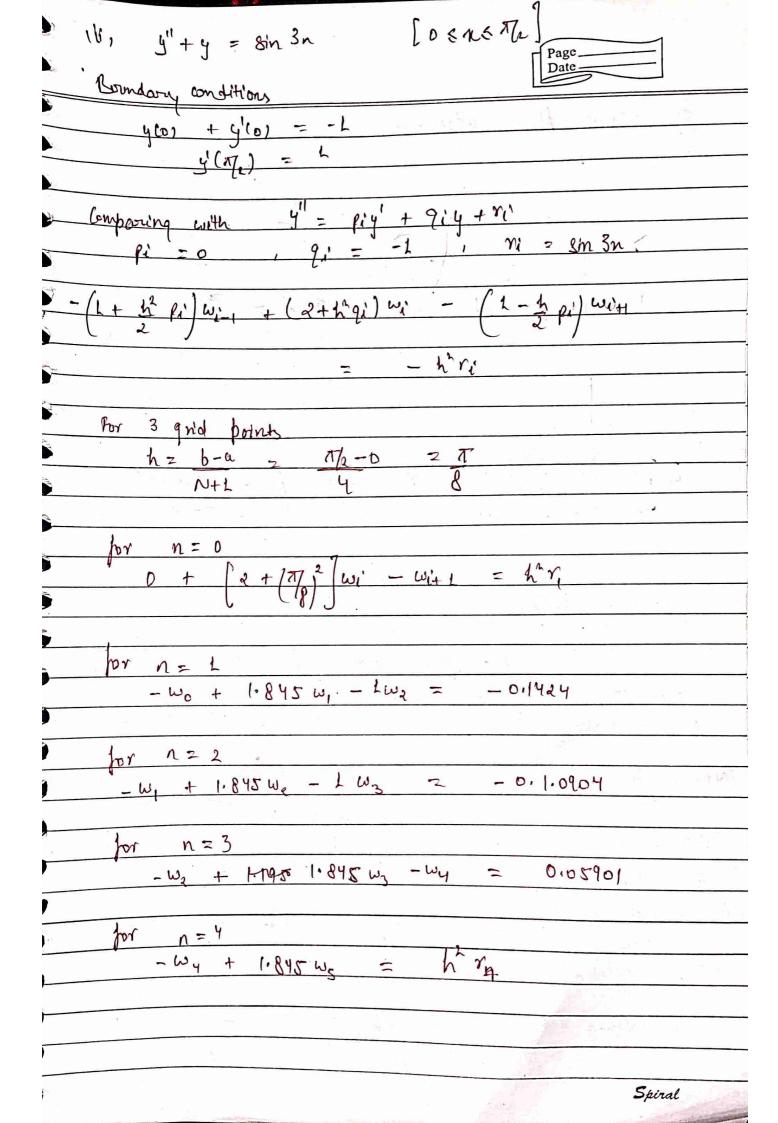
Adding (1) d (2)	The state of the s
y(ni+1) + y(x(2-1) = 2 dy(no) + hry"	(ni) + 1 / (4/2i+)
	~ 7
	+ 41(817)
=> y'(ni) - L (y(ni+1) - 2y(ni)	+ y (n:-1)]
his in the same of	
- hr y(4) (Ent) + y(41(50)
24 6	J
	- A - B
2 y'(ni) = 1 [y(ni+) - 2y(ni) +	4 Con: -1)
i ha	<u> </u>
- h' y'(4) (\(\frac{\xi}{4}i)	N'A
12	
Nor some & Ein Chin, 1 M	UH)
Gentered Difference formula for	5" (Ni) .
Use of this contoned wherence formule	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	in Johnen
But will result in	
y'cno - L General - y'sa	1-1 - 43 y" Cx. 17-
in in the second	6
for some to in (24-1) thing	
	1
Use of the centered difference from	la In gingin
egn will results in	(//
y (ni+1) - 24 (ni) + 4 (ni-1) = p(ni) y (ni	in) - y Cairi)
n L	dh
+ e Chily (ni) + or (no) -	he depeningitioning
	2 Spiral 1



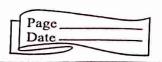
- Using this ex" together with the boundary conditing
- 4(9) = d and 4(b) = B we get deplo
the dystem of linear countries
- Opening
Wo = d 1 WH = B
and and
(-win + 2wi - wi-1) + p(ni) (win - wi-1)
$\frac{\left(-\omega_{i+1}+2\omega_{i-1}-\omega_{i-1}\right)}{h^2}+\frac{p(n_i)\left(-\omega_{i+1}-\omega_{i-1}\right)}{2h}$
N .
+ 9 Chol wi = - r(ni), por each
1 = t, 2, 2, N
= - (1+h plan) w (2+12 charles (1-h - a)
= - (1 + h plno) win-1 + (2 + h 2 (no)) wi - (1-h pcno)
Wey
= h y cuij
_ n . ea)
The mesuring system of egns is expressed in NXN
The tresulting system of equal is expressed in NXN
A w = b where
The 2 Carry Ser
2+ h'g(n) -1+ h p(n) 00
- L - W2 PCM2) 2 + h' 2 CM2) - L+W2 PCM2) -
A = 0 - 0
1 - 1+ hhp6mg
) w,] =
ω_2 ω_2
u _N
Spiral



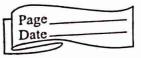
for n= L
0 + [2+0.825x2] Wy - W, = -h2 2x28/n (0,25x)
for $n=2$
-w, + [2+0.625 x2] w2 - w3 = -h^22 sin (7/2)
for $n \ge 3$
-w, + [2+0.625+2]w3-wy = -h-2728in [37/4]
for n=4
-w3 + [2+0.62572] wy - 00 2-h2+28in (7)
In mouring form
1 40
-1 (2+12h5) (-1)
-1 (2012h) -1 4c
1 -1 2+5245 -1 /3 =13
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Algorithm	No.
	19
To approximate the solution of BNP	蜡
	1 4 8
y" = pensy' + gensy + reas por asmét) W
with y(a) = of and y(b) = B;	10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	36
INPUT end potents 9,6; boundary conditions	0
d, p, integer N } 2.	
	1
DUTPUT approximation wi to y (41) for each	Her
020,1 N+1.	
	- 75
Step 2 Set $h = (b-a)/(NH)$;	17
nzath.)	43
$a_1 > 2 + h^2 \ell ln$;	1.5
$b_1 = -1 + (1/2) p(n)$:	
$d_1 = -h^2 r(n) + (1 + (h/2) p(n)) \propto$	- 5
	i.
Step 2 for 1' = 2 N-L	
set n = a + ih;	- A
ai = 2+h-2(n);	[]
bi = -1 + (M2) P(n);	-1-1
C' = -L - (h/L) pas;	- 4
$di' = -h^{L}Y(h)$.	-4
	-
Step 3 Set n= b-h 1	1
$9N = 2 + h^{L}e(n);$	
$C_N = -1 - (h/2) P(n);$	4
$dn = -h^2 r(n) + (L - (h/2) p(n)) \beta.$	1.4
	17



Ø.	Joy 4	set 1, = a, ;
١		up u, = b/a,
Š		71 2 d1/4
) —		
5	SHY 5	for t = 2 N-L
	1. 24 4 ³ 1,	set li = ai - Ci w -1;
<u></u>		4i = 6i/4i
1	The state of	Zi = (di - co zi-1)/4.
<u> </u>	- 16 - 4	The state of the s
3	246 P	get for = ont waptone,
<u></u>	SHY 6	ser ln = an - cn un-1;
Ò		Set $ln = an - c_n v_{N-1}$; $2n = (dn - (n v_{N-1} - 1) / dn$
7		-10 2 (41) (104) -2) [101)
3	Step 7	Set Wo = x;
2		$w_{NH} = \beta$,
	, _ t _k	$W_{N} = Z_{N}$
<u> </u>		
—	Step 8	for 1' - 200 N-1
)		set wi z Zi-Wiwity.
	SHy 9	Por i 20.2, NHL 6
)		ser nza+ih;
, i		OUTPUT (N, W).
7	- tow	
). 	Step Lo	STOP
,		
0	\(\frac{1}{2}\)	
-		
*		