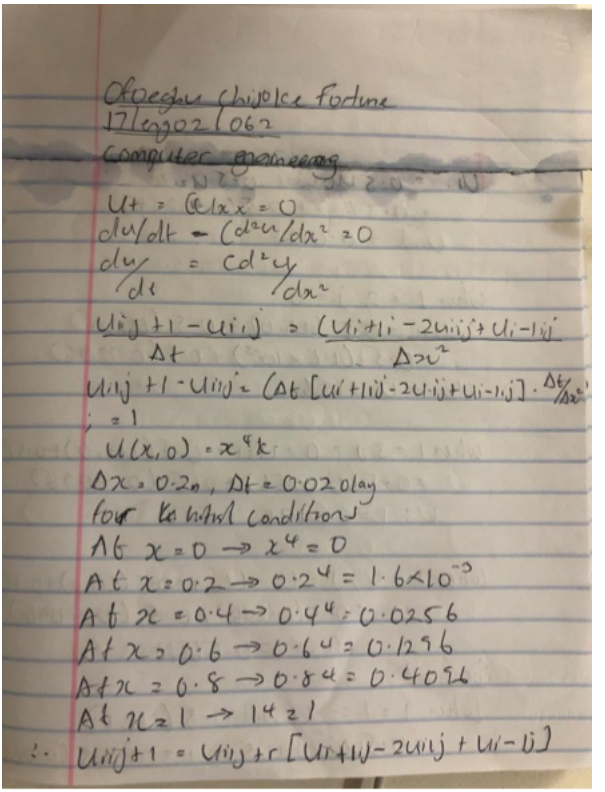
Maths assignment



$u_{i,j+1} = [u_{i-1,j} + (1-2r)u_{i,j} + r(u_{i+1,j}$ —①

when $i = 1, j = 0$

$u_{1,1} = 0.5u_{0,0} + 0.5u_{2,0}$

$= 0.5(0) + 0.5(0.0256)$

$u_{1,1} = 0.0128$

When $i = 2, j = 0$

$u_{2,1} = 0.5(u_{1,0}) + 0.5(u_{3,0})$

$= 0.5(1.6 \times 10^{-3}) + 0.5(0.1296)$

$u_{2,1} = 0.0656$

When $i = 3, j = 0 = u_{3,1} = 0.5(u_{2,0}) + 0.5(u_{4,0})$

$= 0.5(0.0256) + 0.5(0.4096)$

$u_{3,1} = 0.2176$

When $i = 4, j = 0 = u_{4,1} = 0.5(u_{3,0}) + 0.5(u_{5,0})$

$= 0.5(0.256) + 0.5(0.4096)$

$u_{4,1} = 0.5648$

for $j = 1$

When $i = 1 :- u_{1,2} = 0.5(u_{2,1})$

$= 0.5u_{0,1} + 0.5u_{2,1} = 0 + 0.5(0.0656)$

$u_{1,2} = 0.0328$

When $i = 2$: $u_{2,2} = 0.5(u_{1,1}) + 0.5(u_{3,1})$

$0.5(0.0128) + 0.5(0.2176)$

$u_{2,2} = 0.1152$

Where $i = 3$: $u_{3,2} = 0.5(u_{2,1}) + 0.5(u_{4,1})$

$0.5(0.0656) + 0.5(0.5648)$

$u_{3,2} = 0.3152$

When $i = 4$ $u_{4,2} = 0.5(u_{3,1}) + 0.5(u_{5,1})$

$= 0.5(0.2176) + 0.5(1)$

$u_{4,2} = 0.6088$

For $j = 2$

When $i = 1$: $u_{1,3} = 0.5(u_{0,1}) + 0.5(u_{2,2})$

$= 0 + 0.5(0.1152) = 0.0576$..

When $i = 2$, $u_{2,3} = 0.5(u_{1,2}) + 0.5(u_{3,2})$

$= 0.5(0.0328) + 0.5(0.3152)$

$= 0.174$

When $i = 3$: $u_{3,3} = 0.5(u_{2,2}) + 0.5(u_{4,2})$
$= 0.5(0.1152) + 0.5(0.6085)$
$= 0.362$

When $i = 4$ $u_{4,3} = 0.5(u_{3,2}) + 0.5(u_{3,1})$
$= 0.5(0.3152) + 0.5(1)$
$u_{4,3} = 0.6576$

for $j = 3$
When $i = 1$ $u_{1,4} = 0.5(u_{0,3}) + 0.5(u_{2,2})$
$= 0.5(0) + 0.5(0.174)$
$= 0.084$

When $i = 2$ $u_{2,4} = 0.5(u_{1,3}) + 0.5(u_{3,3})$
$= 0.5(0.0576) + 0.5(0.362)$
$= 0.2098$

When $i = 3$ $u_{3,4} = 0.5(u_{2,3}) + 0.5(u_{4,3})$
$= 0.5(0.174) + 0.5(0.6526)$
$= 0.4158$

When $i = 4$ $u_{4,4} = 0.5(u_{3,3}) + 0.5(u_{4,3})$
$= 0.5(0.362) + 0.5(1)$
$= 0.681$

For $j = 4$
When $i = 1$ $u_{1,5} = 0.5(u_{0,4}) + 0.5(u_{1,4})$
$= 0.5(0.2098) = 0.1049$

When $i = 2$ $u_{2,5} = 0.5(u_{1,4}) + 0.5(u_{3,4})$
$= 0.5(0.087) + 0.5(0.408)$
$= 0.2514$

When $i = 3$ $u_{3,4} = 0.5(u_{3,3}) + 0.5(u_{4,3})$
$= 0.5(0.2098) + 0.5(0.681)$
$= 0.4454$

When $i = 4$ $u_{4,5} = 0.5(u_{3,4}) + 0.5(u_{5,4})$
$= 0.5(0.4158) + 0.5(1)$
$= 0.7079$

Δt	$t_{final}(k)$						
0.1	5	0	0.1049	0.2514	0.4454	0.707	1
0.08	4	0	0.087	0.2098	0.488	0.671	1
0.06	3	0	0.0626	0.174	0.342	0.852	1
0.04	2	0	0.0328	0.1152	0.3152	0.604	1
0.02	1	0	0.0128	0.0686	0.2124	0.544	1
0	0	0	0.0014	0.028	0.1284	0.401	1
Δx		0	0.2	0.4	0.6	0.8	1
	i	0	1	2	3	4	5

0.1	0	0.1049	0.2514	0.4454	0.7079	1
0.08	0	0.087	0.2098	0.4158	0.681	1
0.06	0	0.0576	0.174	0.362	0.6576	1
0.04	0	0.0328	0.1152	0.3152	0.6088	1
0.02	0	0.0128	0.0656	0.2176	0.5648	1
0	0	0.0016	0.0256	0.1296	0.4096	1
	0	0.2	0.4	0.6	0.8	1