

% This is the same info as writeUpProjectA.pdf %

Project A:

Question 1:

For n = 50 I got the following results:

W
0.0200
0.0493
0.0836
0.1126
0.1205
0.0923
0.0229
-0.0768
-0.1825
-0.2672
-0.3133
-0.3182
-0.2911
-0.2459
-0.1950
-0.1459
-0.1021
-0.0633
-0.0272
0.0095
0.0512
0.1033
0.1719
0.2631
0.3803
0.5199
0.6649
0.7804
0.8164
0.7228
0.4767
0.1046
-0.3170
-0.6895
-0.9351
-1.0254
-0.9812
-0.8510
-0.6851
-0.5199
-0.3740
-0.2522

-0.1511
-0.0630
0.0213
0.1121
0.2206
0.3588
0.5371
0.7606

For more results run the file partAQuestion1.m, found in folder ProjectA, and change the value of n.

Question 2:

D0y	w
0.0200	0.0200
0.0493	0.0493
0.0836	0.0836
0.1126	0.1126
0.1205	0.1205
0.0923	0.0923
0.0229	0.0229
-0.0768	-0.0768
-0.1825	-0.1825
-0.2672	-0.2672
-0.3133	-0.3133
-0.3182	-0.3182
-0.2911	-0.2911
-0.2459	-0.2459
-0.1950	-0.1950
-0.1459	-0.1459
-0.1021	-0.1021
-0.0633	-0.0633
-0.0272	-0.0272
0.0095	0.0095
0.0512	0.0512
0.1033	0.1033
0.1719	0.1719
0.2631	0.2631
0.3803	0.3803
0.5199	0.5199
0.6649	0.6649
0.7804	0.7804
0.8164	0.8164
0.7228	0.7228
0.4767	0.4767
0.1046	0.1046
-0.3170	-0.3170
-0.6895	-0.6895

-0.9351	-0.9351
-1.0254	-1.0254
-0.9812	-0.9812
-0.8510	-0.8510
-0.6851	-0.6851
-0.5199	-0.5199
-0.3740	-0.3740
-0.2522	-0.2522
-0.1511	-0.1511
-0.0630	-0.0630
0.0213	0.0213
0.1121	0.1121
0.2206	0.2206
0.3588	0.3588
0.5371	0.5371
0.7606	0.7606

The values of D_0y and w are the exact same ones, thus $D_0y = w$. If you want to double check results change the value of n in the file `partAQuestion2.m` inside folder `ProjectA` and run it.

Question 3:

To see the graphs please open the jpg images that start with `partAQuestion3` found inside `ProjectA` folder or simply run `partAQuestion3.m` found in folder `ProjectA`.

Question 4:

a:

To see the graphs please open the jpg images that start with `partAQuestion4a` found inside `ProjectA` folder or simply run `partAQuestion4a.m` found in folder `ProjectA`.

b:

To see the graphs please open the jpg images that start with `partAQuestion4b` found inside `ProjectA` folder or simply run `partAQuestion4b.m` found in folder `ProjectA`.

c:

To see the graphs please open the jpg images that start with `partAQuestion4c` found inside `ProjectA` folder or simply run `partAQuestion4c.m` found in folder `ProjectA`.

Question 5:

$D_0 =$

0	1	0	0	0	0	0	0	0	-1
-1	0	1	0	0	0	0	0	0	0
0	-1	0	1	0	0	0	0	0	0
0	0	-1	0	1	0	0	0	0	0
0	0	0	-1	0	1	0	0	0	0
0	0	0	0	-1	0	1	0	0	0
0	0	0	0	0	-1	0	1	0	0
0	0	0	0	0	0	-1	0	1	0
0	0	0	0	0	0	0	-1	0	1
1	0	0	0	0	0	0	0	-1	0

$D_0 D_0 =$

-2	0	1	0	0	0	0	0	1	0
0	-2	0	1	0	0	0	0	0	1
1	0	-2	0	1	0	0	0	0	0
0	1	0	-2	0	1	0	0	0	0
0	0	1	0	-2	0	1	0	0	0
0	0	0	1	0	-2	0	1	0	0
0	0	0	0	1	0	-2	0	1	0
0	0	0	0	0	1	0	-2	0	1
1	0	0	0	0	0	1	0	-2	0
0	1	0	0	0	0	0	1	0	-2

The matrix of $D_0 D_0$ has one more nonzero diagonal than the matrix of D_0 .

As for how well it calculates $f''(x)$, well it only gives a good accurate for i values that are close to n . As seen below onlt the last three calculations can be said to be somewhat accurate for $n = 19$.

$D_0 D_0 y$	$f''(x)$
0.0016	1.0000
-0.0042	0.0158
-0.0379	-2.3968
-0.0583	-1.8851
-0.0041	0.4789
0.0668	0.9649
0.0841	0.5723
0.0844	0.3704
0.1278	0.4920
0.1953	0.8812
0.0718	0.7885
-0.4126	-1.2427
-0.7640	-2.6813
-0.3857	-0.5781
0.2677	0.9529

0.4960	0.7763
0.4207	0.4311
0.4425	0.3906
0.6665	0.6693

For more results run the file partAQuestion5.m, found in folder ProjectA, and change the value of n.

Question 6:

As can be seen from the jpg images, that start with partAQuestion6, as the order of differentiation increases the bigger the n gets, and therefore $h(h=6\pi/n)$ gets small, the more accurate the approximate value is to the real value. For $n = 1000$ and $n = 15000$ there seems to be almost no change, which might be due to how the computer calculates very small numbers.

To test out results open the file partAQuestion6.m in folder ProjectA and change the value of n and see how the graphs change with different n.