Scientific Computing (MA322)

Lab 06

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Q-1:
Exact value of function at 2.25: 9.487736e+00

Part 1: Newton's forward difference method.
f(2.25) = 9.496925e+00

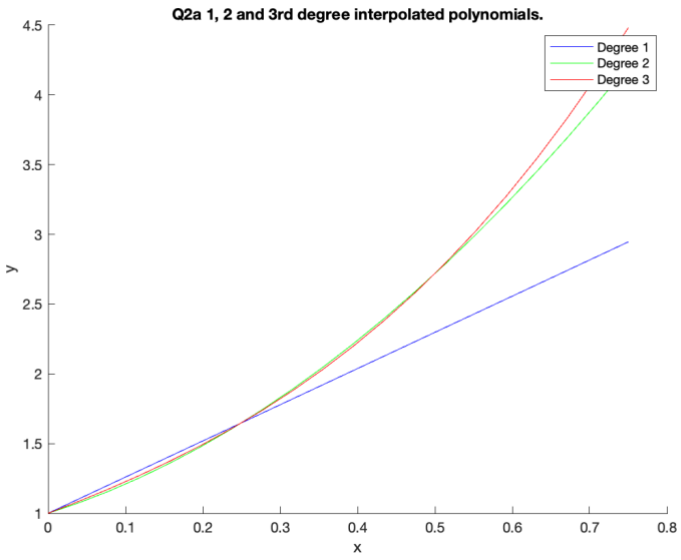
Part 2: Newton's backward difference method.
f(2.25) = 9.496925e+00

Q2

Part 1)
Newton's forward difference method of degree 1.
f(0.43) = 2.115798e+00
(Note: 1st two points were considered for interpolation.)

Newton's forward difference method of degree 2.
f(0.43) = 2.376383e+00
(Note: 1st three points were considered for interpolation.)

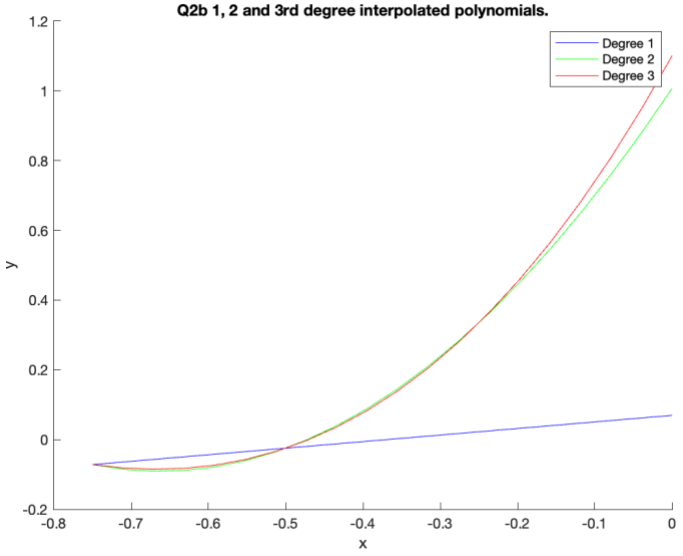
Newton's forward difference method of degree 3.
f(0.43) = 2.360605e+00



Part 2)
Newton's forward difference method of degree 1.
f(-0.33) = 6.625000e-03
(Note: 1st two points were considered for interpolation.)

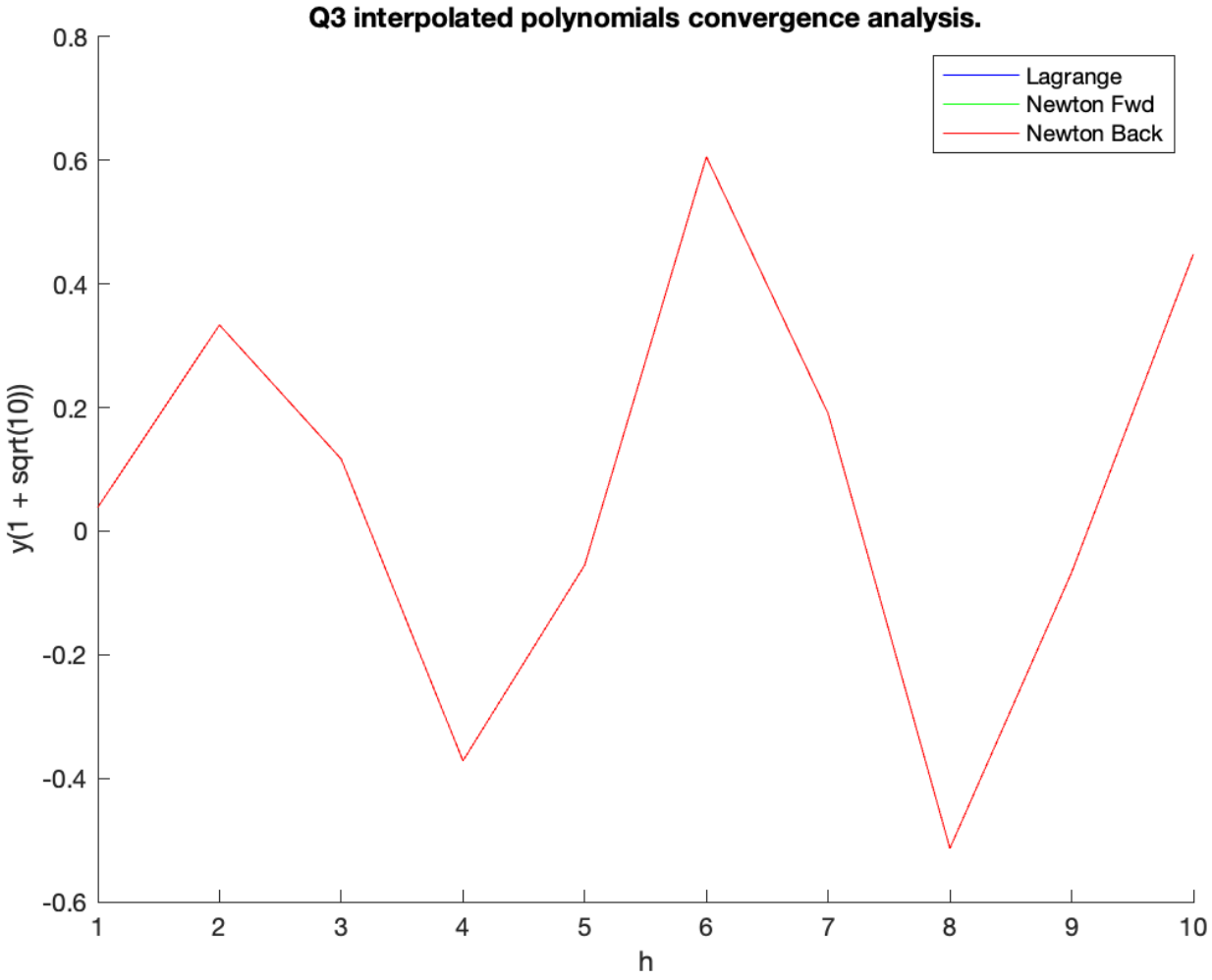
Newton's forward difference method of degree 2.
f(-0.33) = 1.803056e-01
(Note: 1st three points were considered for interpolation.)

Newton's forward difference method of degree 3.
f(-0.33) = 1.745185e-01



Q3

Step sizes:	10	5	3.33	2.5	2	1.67	1.42	1.25	1.11	1
Lagrange:	0.0385	0.3337	0.1166	-0.3718	-0.0549	0.6059	0.1902	-0.5134	-0.0668	0.4483
Newton fwd:	0.0385	0.3337	0.1166	-0.3718	-0.0549	0.6059	0.1902	-0.5134	-0.0668	0.4483
Newton back:	0.0385	0.3337	0.1166	-0.3718	-0.0549	0.6059	0.1902	-0.5134	-0.0668	0.4483



Note: The plot color is red as all methods give the same sequence of points.

Observation: The value f $(1 + 10^{0.5})$ diverges for Lagrange, Newton Forward and Backward Difference methods.

More points don't guarantee convergence of points. Another reason could be the increasing upper bound on error in the interpolation of $1 / (1 + x^2)$ as n with increase in n, the magnitude of the n^{th} derivative of $1 / (1 + x^2)$ increases.