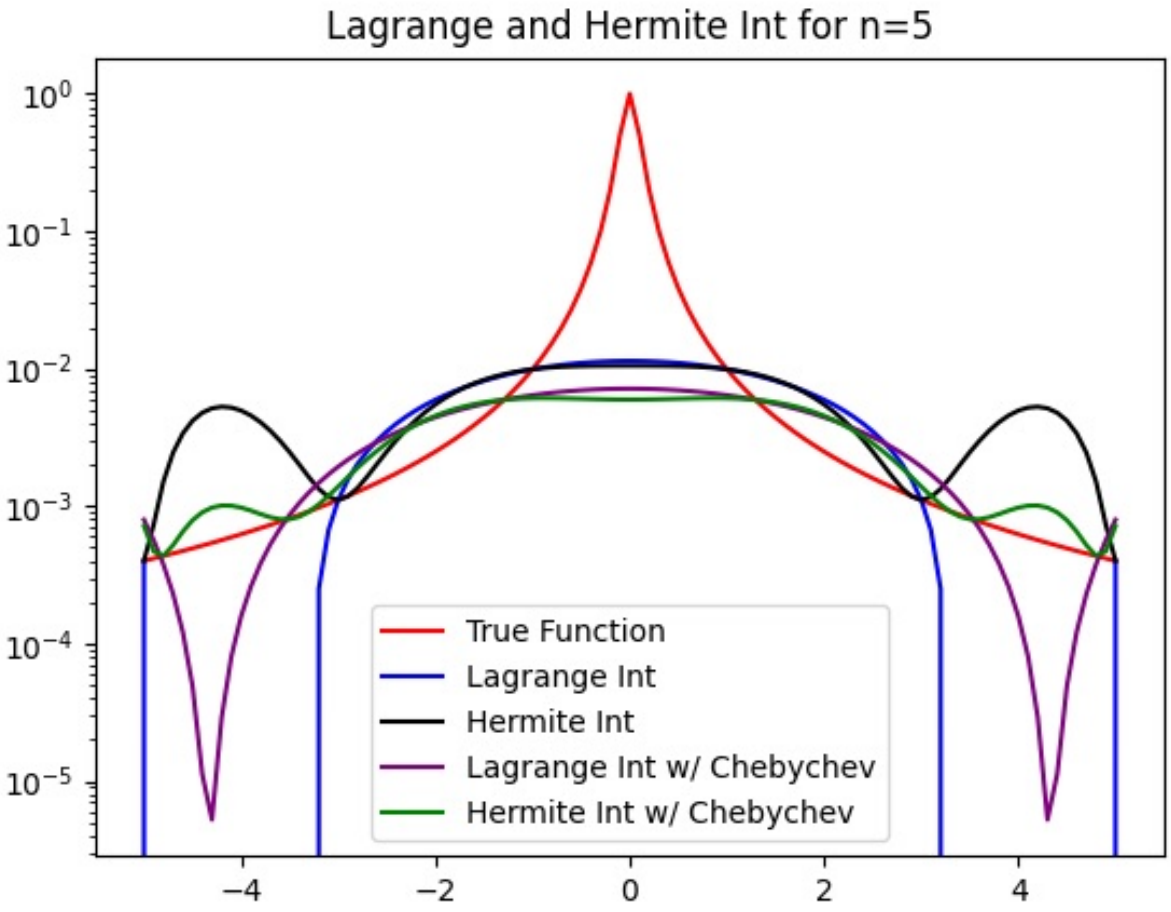
APPM4600 HW #8

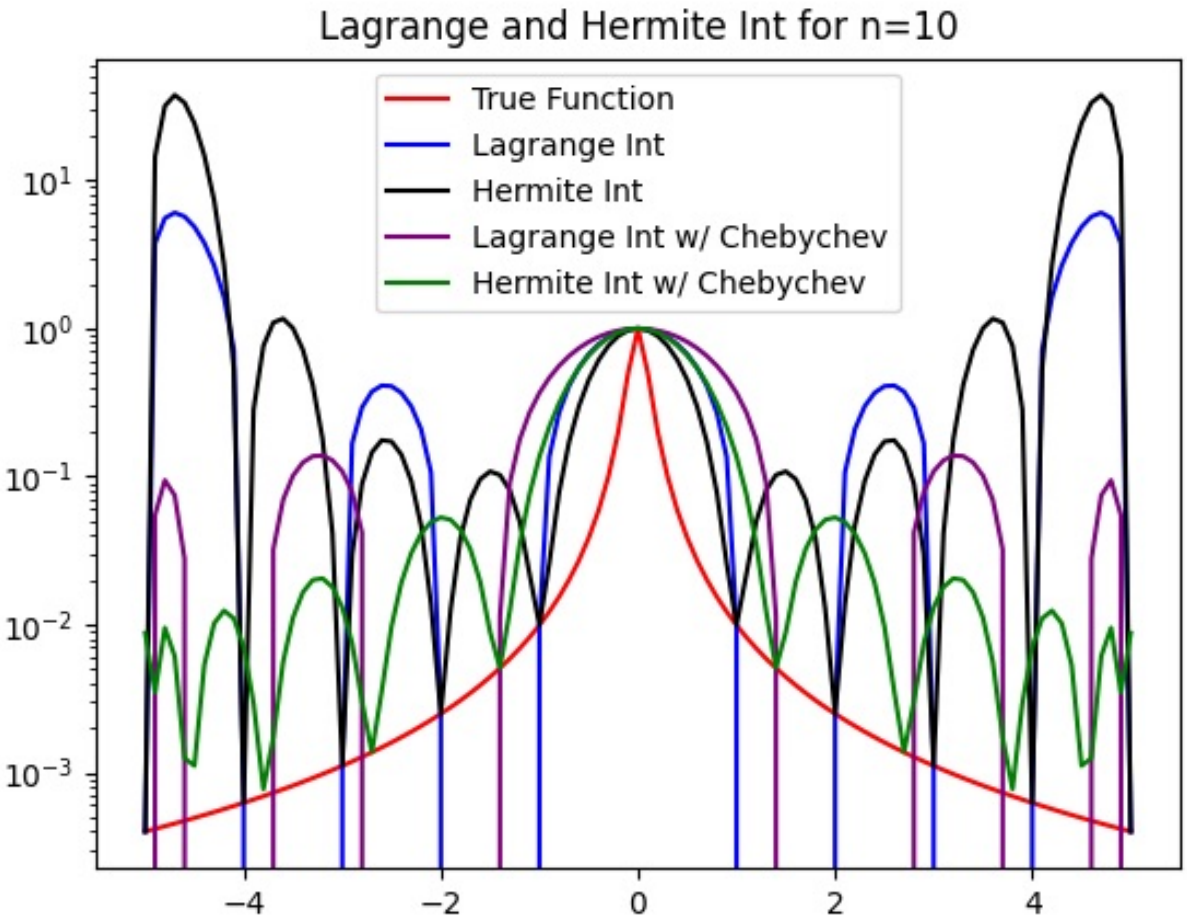
Owen O'Connor

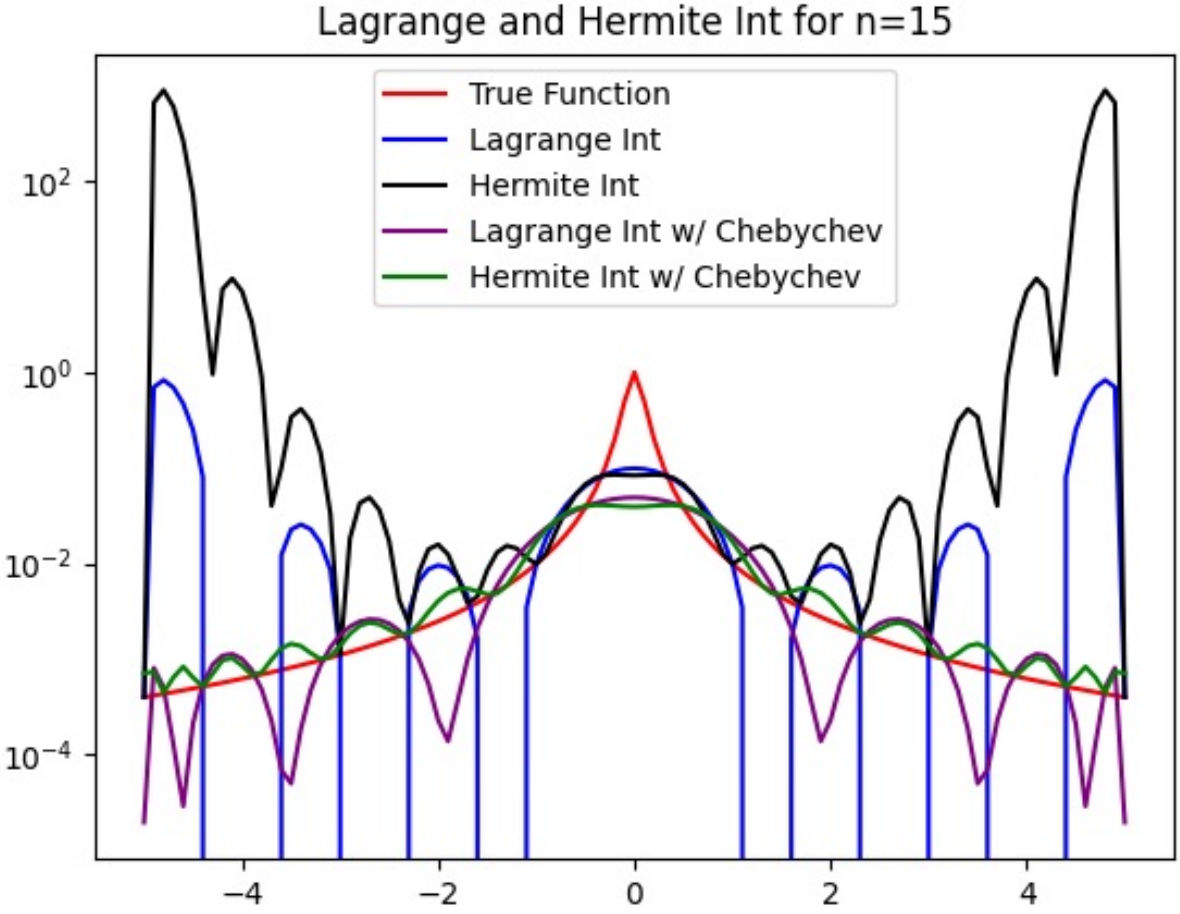
1) See code on GitHub

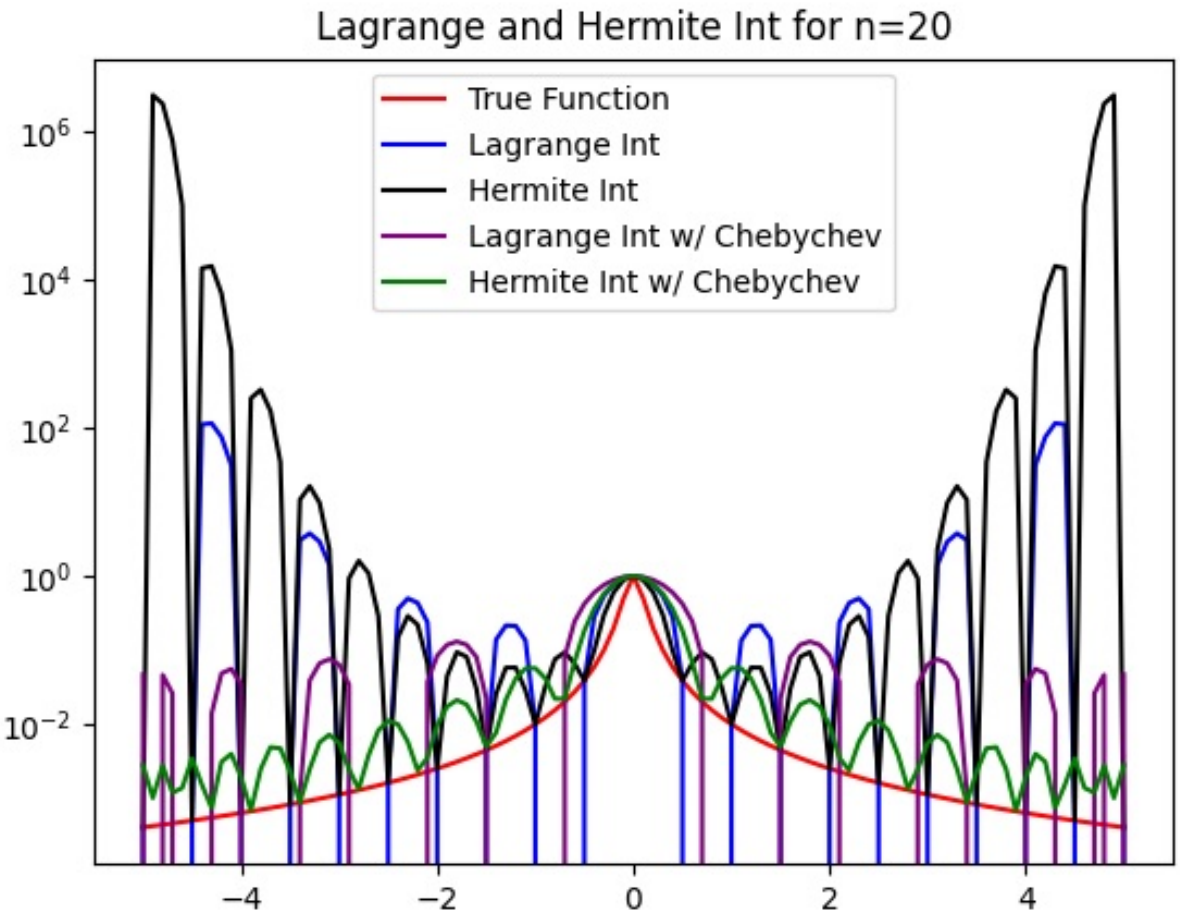
I couldn't get cubic spline code to work properly

2) See code on Github

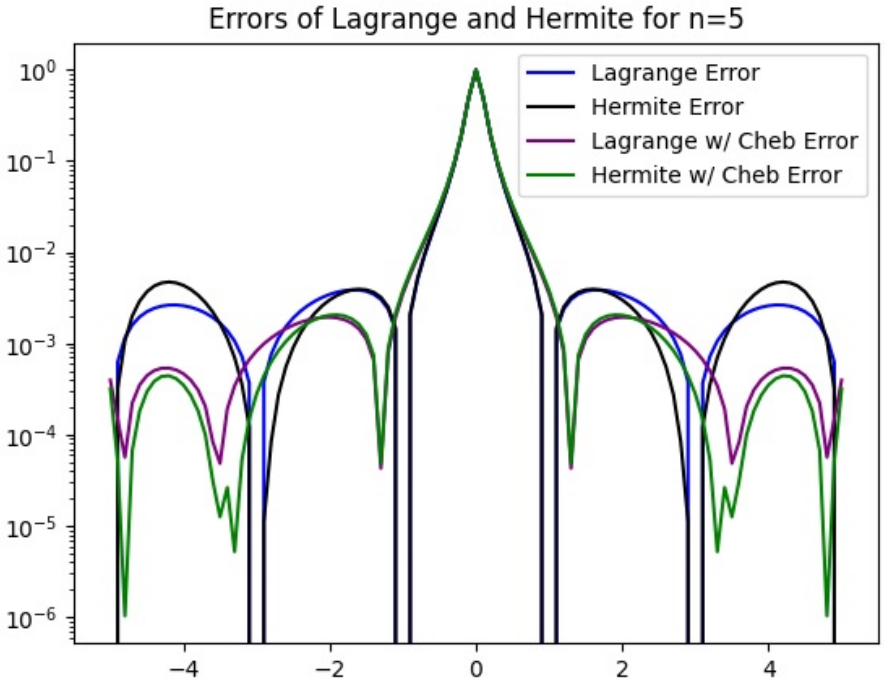


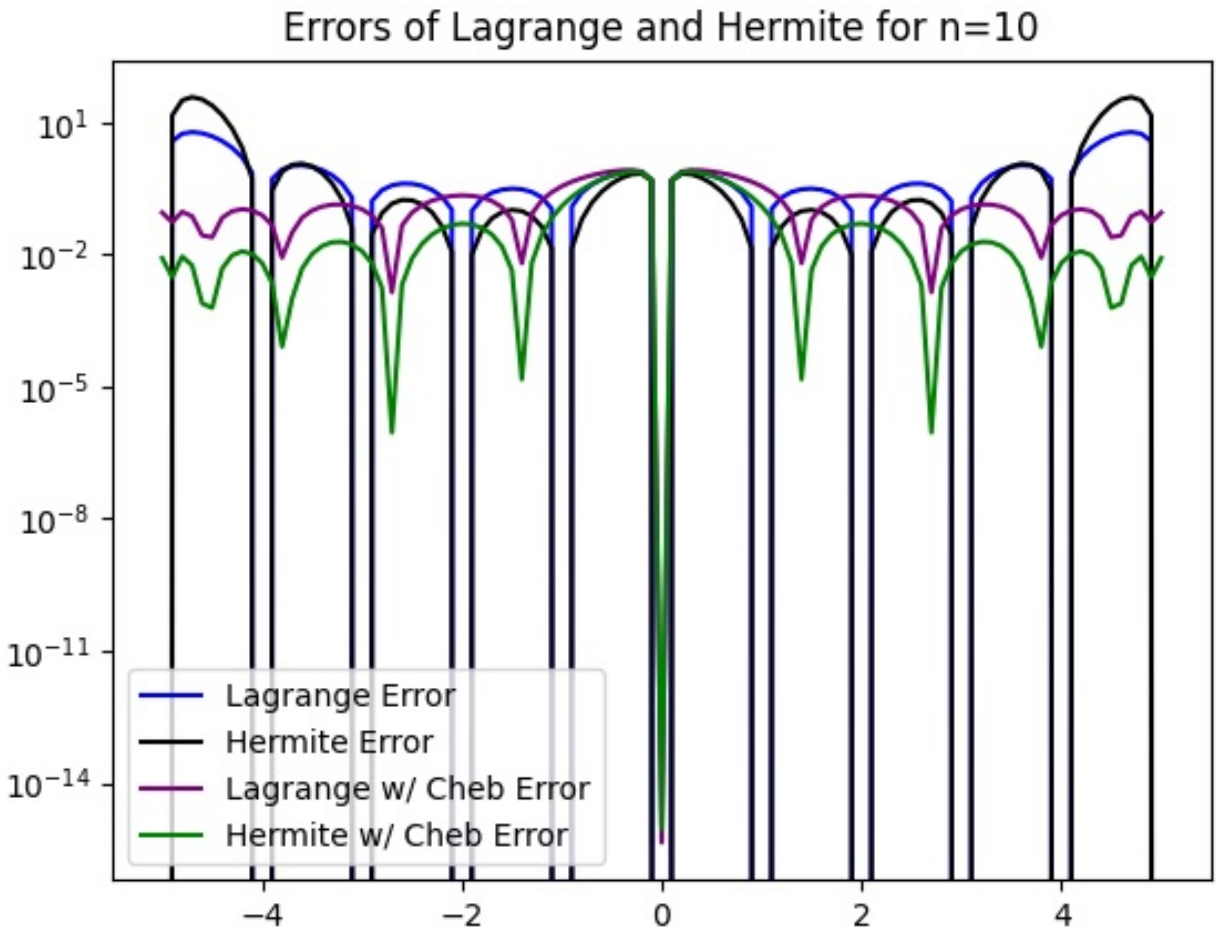

Lagrange and Hermite Int for n=10
True Function
Lagrange Int
Hermite Int
Lagrange Int w/ Chebychev
Hermite Int w/ Chebychev
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
−4
−2
0
2
4

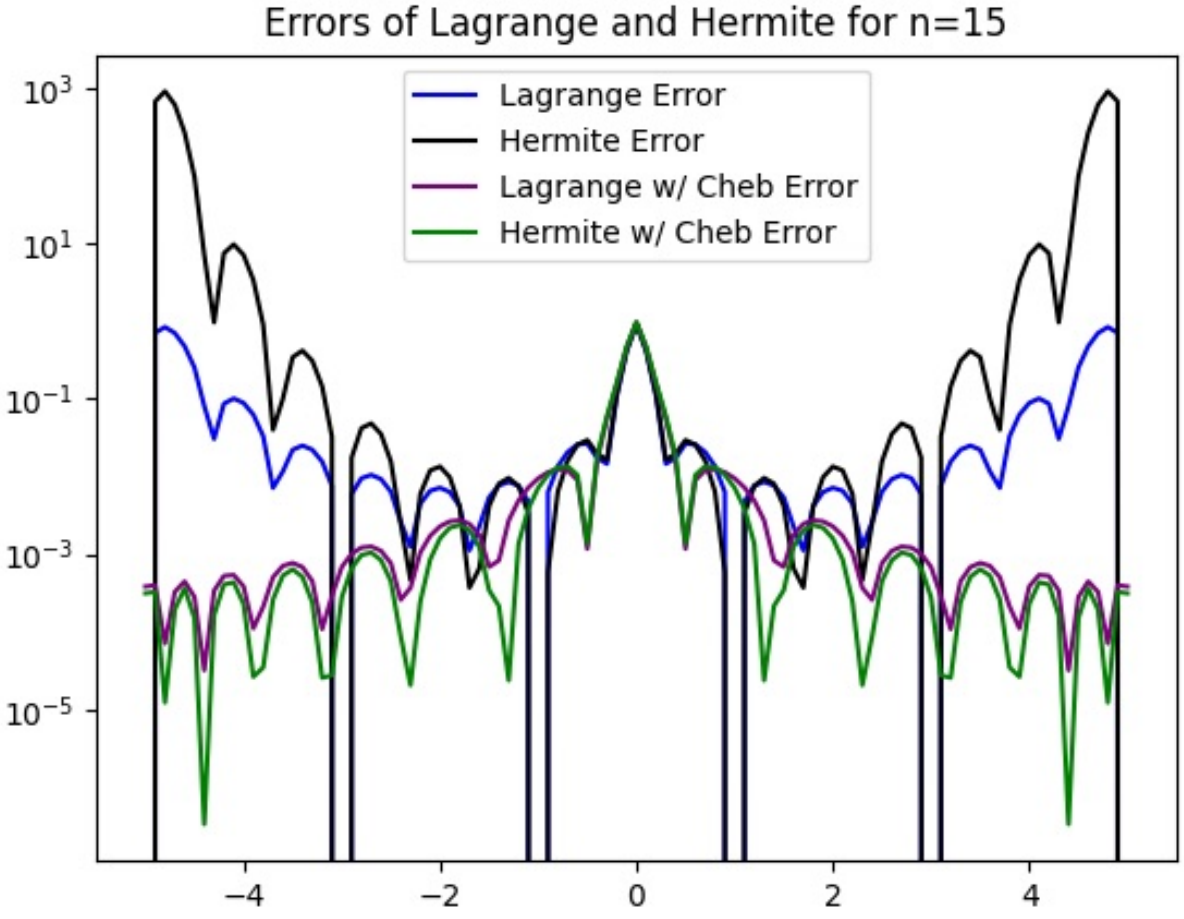

Lagrange and Hermite Int for n=15
True Function
Lagrange Int
Hermite Int
Lagrange Int w/ Chebychev
Hermite Int w/ Chebychev
10^{2}
10^{0}
10^{-2}
10^{-4}
−4
−2
0
2
4

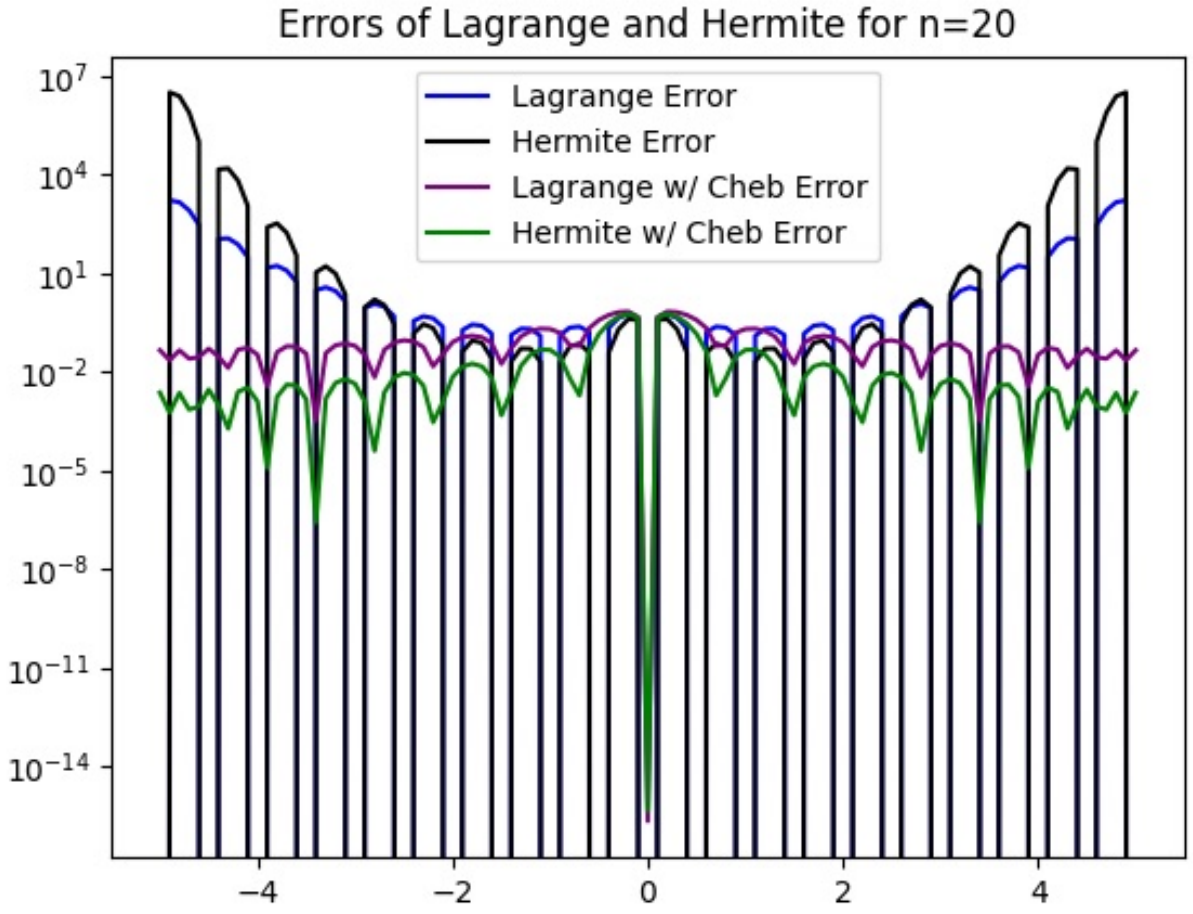

Lagrange and Hermite Int for n=20
True Function
Lagrange Int
Hermite Int
Lagrange Int w/ Chebychev
Hermite Int w/ Chebychev
10^6
10^4
10^2
10^0
10^{-2}
−4
−2
0
2
4

Errors:


Errors of Lagrange and Hermite for n=5
Lagrange Error
Hermite Error
Lagrange w/ Cheb Error
Hermite w/ Cheb Error
10^0
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
−4
−2
0
2
4


Errors of Lagrange and Hermite for n=10
10^{1}
10^{-2}
10^{-5}
10^{-8}
10^{-11}
10^{-14}
Lagrange Error
Hermite Error
Lagrange w/ Cheb Error
Hermite w/ Cheb Error
−4
−2
0
2
4


Errors of Lagrange and Hermite for n=15
10^{3}
10^{1}
10^{-1}
10^{-3}
10^{-5}
Lagrange Error
Hermite Error
Lagrange w/ Cheb Error
Hermite w/ Cheb Error
−4
−2
0
2
4



As seen in the graphs above, Hermite performs the best near central peak but is worse than Lagrange at endpoints, but when you use Chebyshev nodes, Hermite is better than Lagrange at endpoints.

3) $f(x=0) = f(x=2\pi)$ and

$f'(x=0) = f'(x=2\pi)$ and

$f''(x=0) = f''(x=2\pi)$

if we have N nodes then

$S_1(0) = S_N(2\pi)$

$S_1'(0) = S_N'(2\pi)$

$S_1''(0) = S_N''(2\pi)$