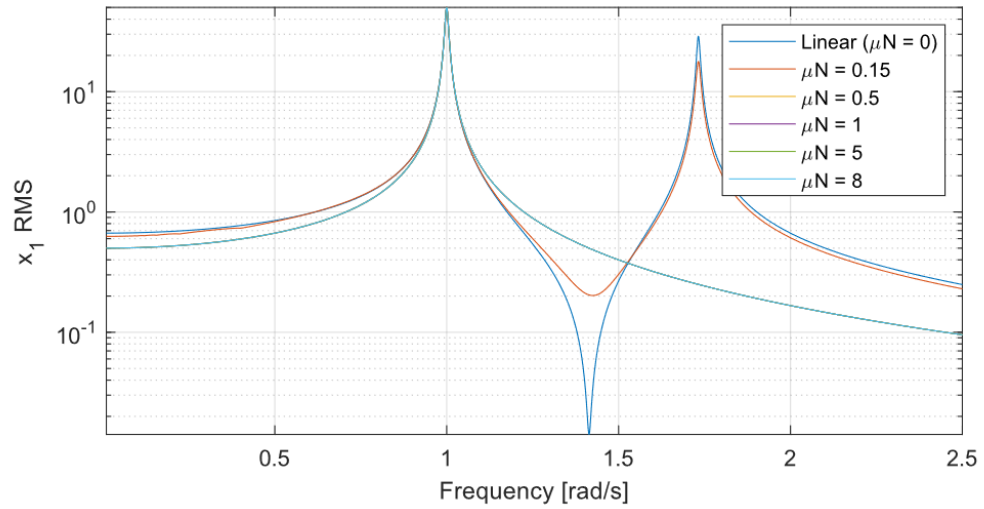
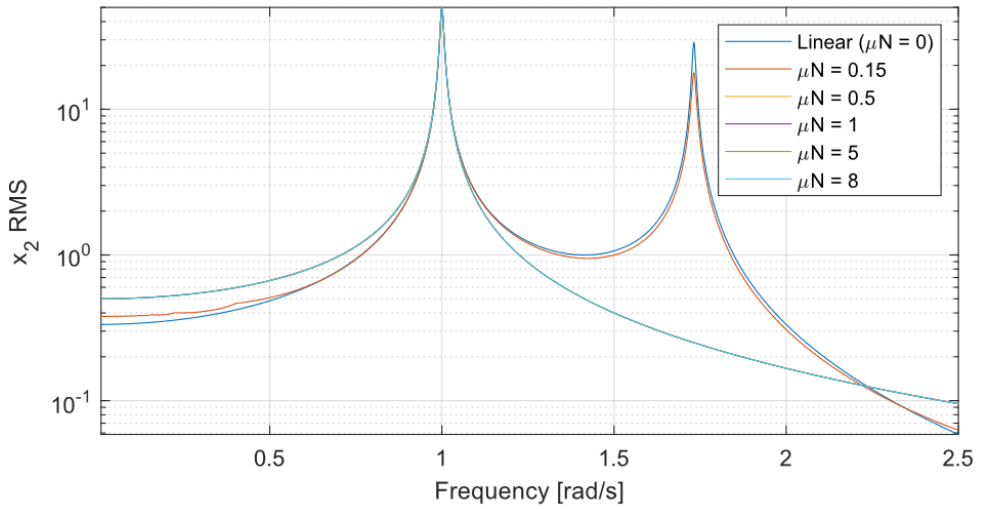
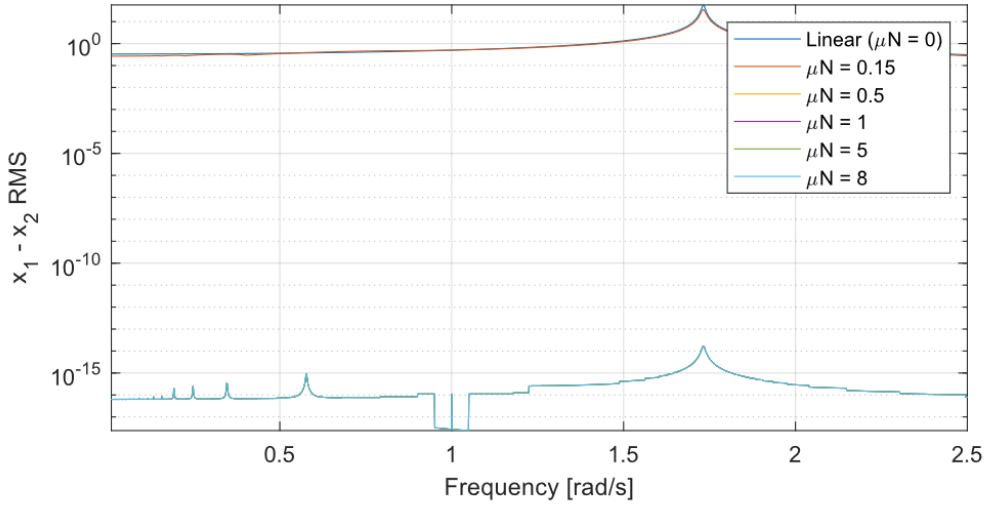
Elapsed time without Jacobian: 1032s
Elapsed time with Jacobian: 670s

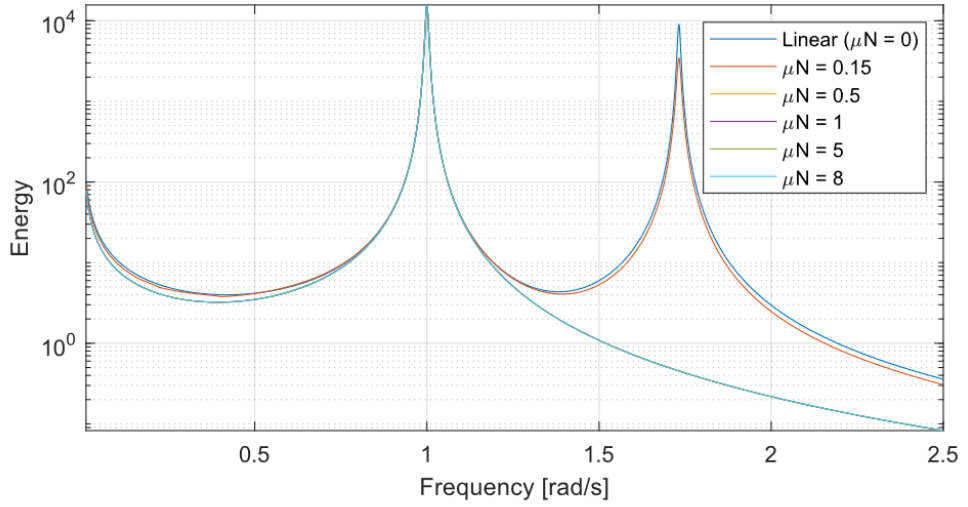
Frequencies: 0.01:0.001:2.5

Frequency Response Curve (Nϕ = 60, |F| = 1)

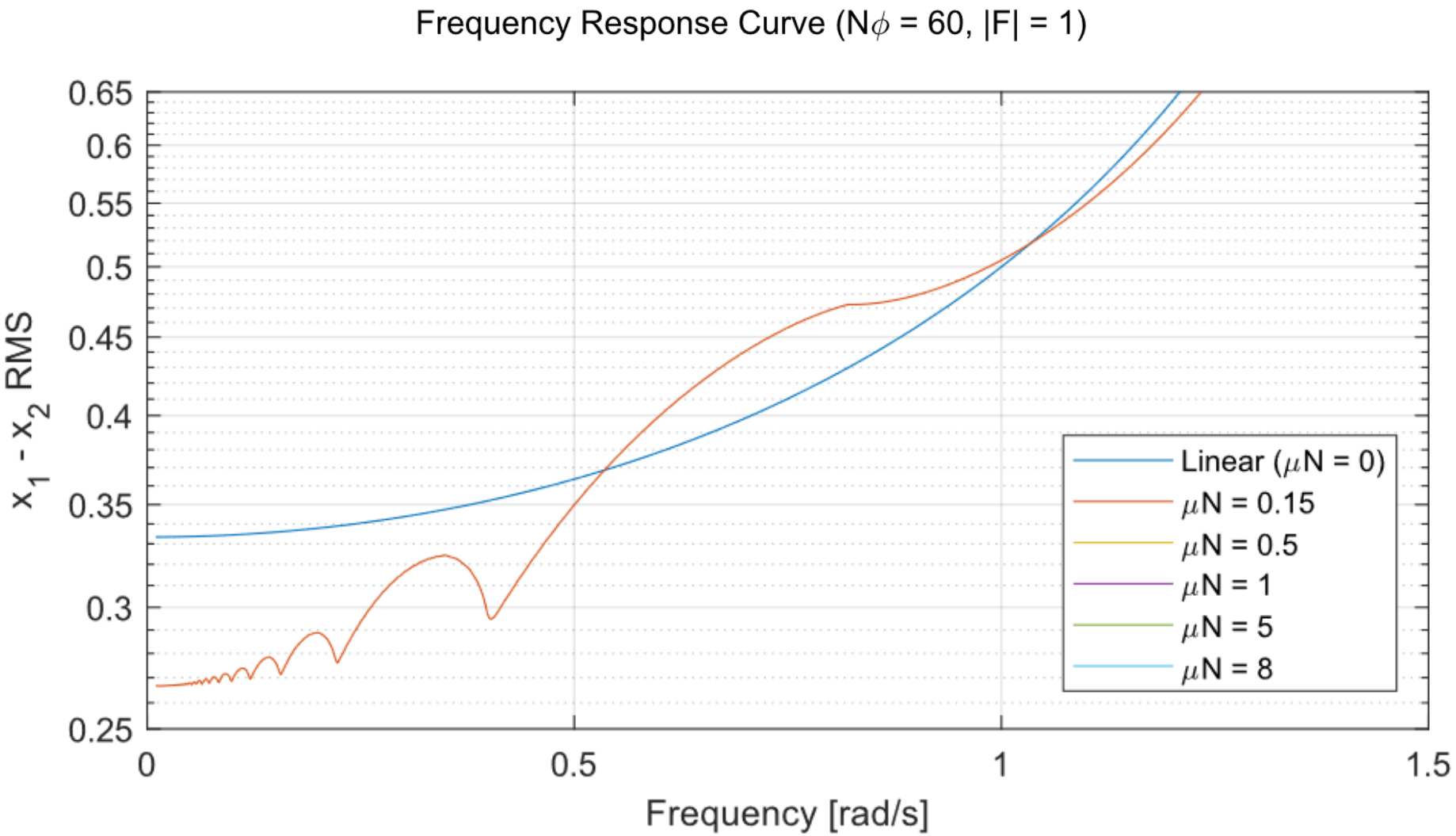






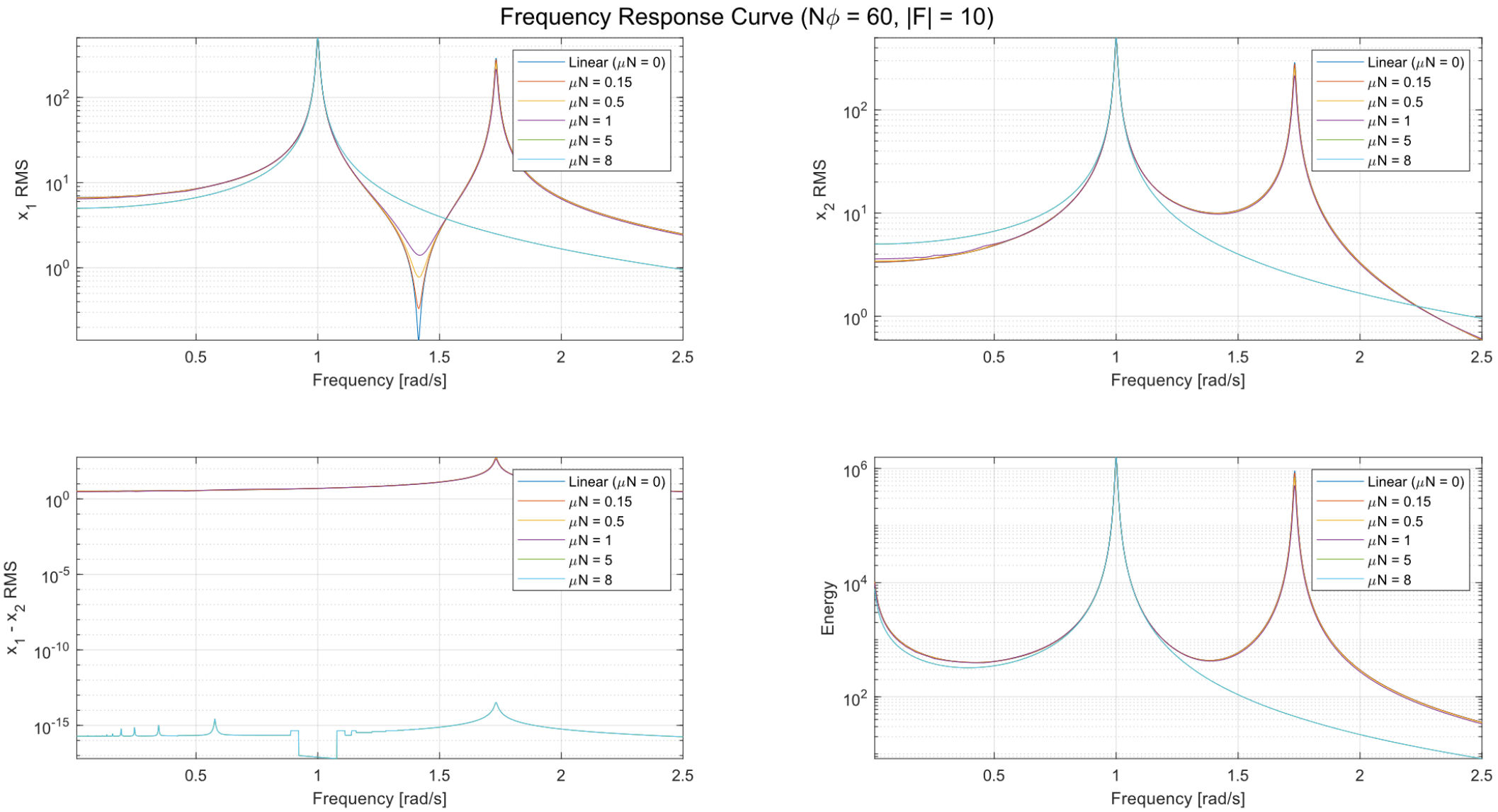


Superharmonic resonances for muN = 0.15 at: 0.818, 0.35, 0.195, 0.141 rad/s



Elapsed time without Jacobian: 1256s
Elapsed time with Jacobian: 982s

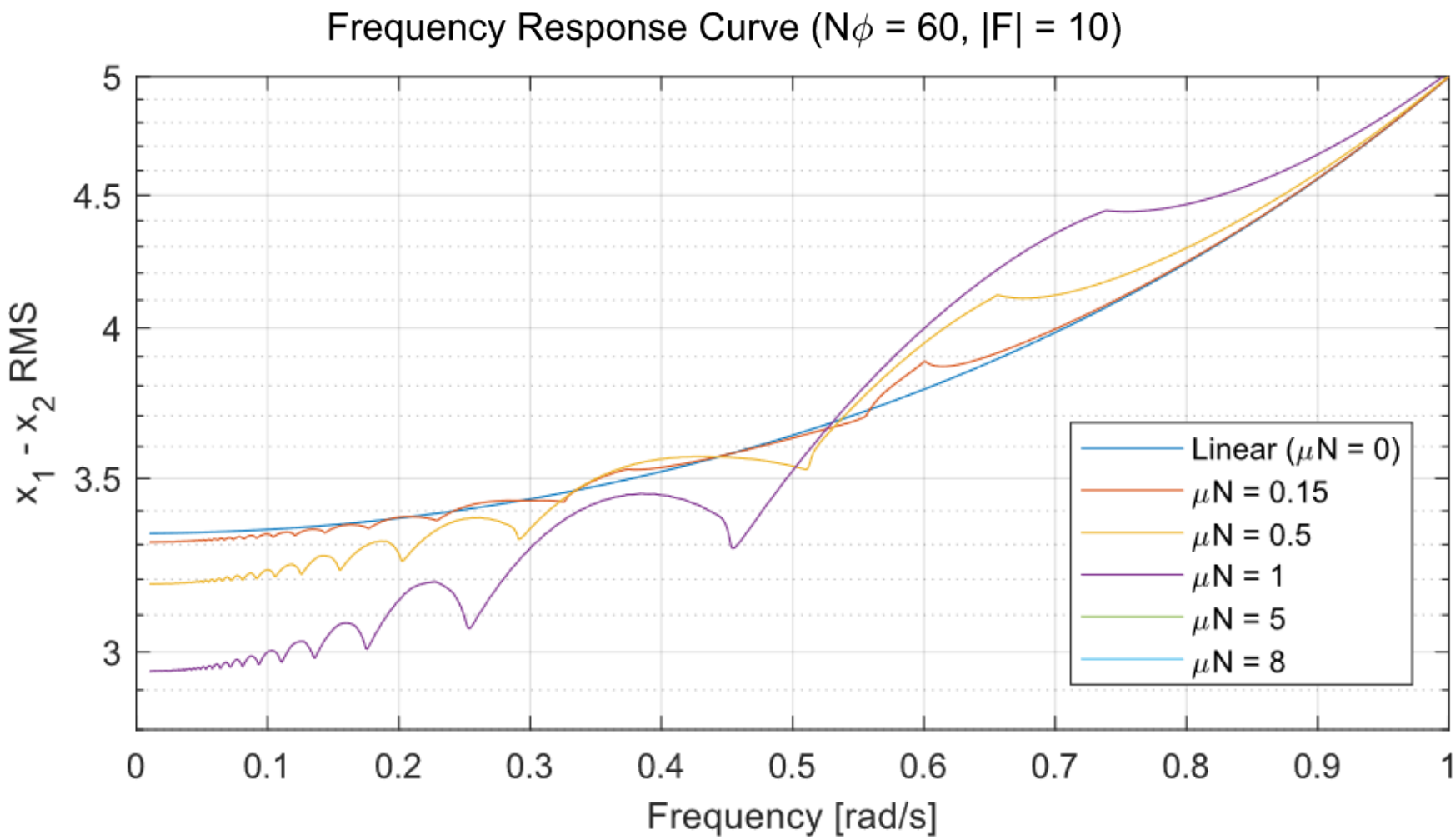
Frequencies: 0.01:0.001:2.5



Superharmonic resonances for muN = 0.15 at: 0.601, 0.374, 0.308, 0.208 rad/s

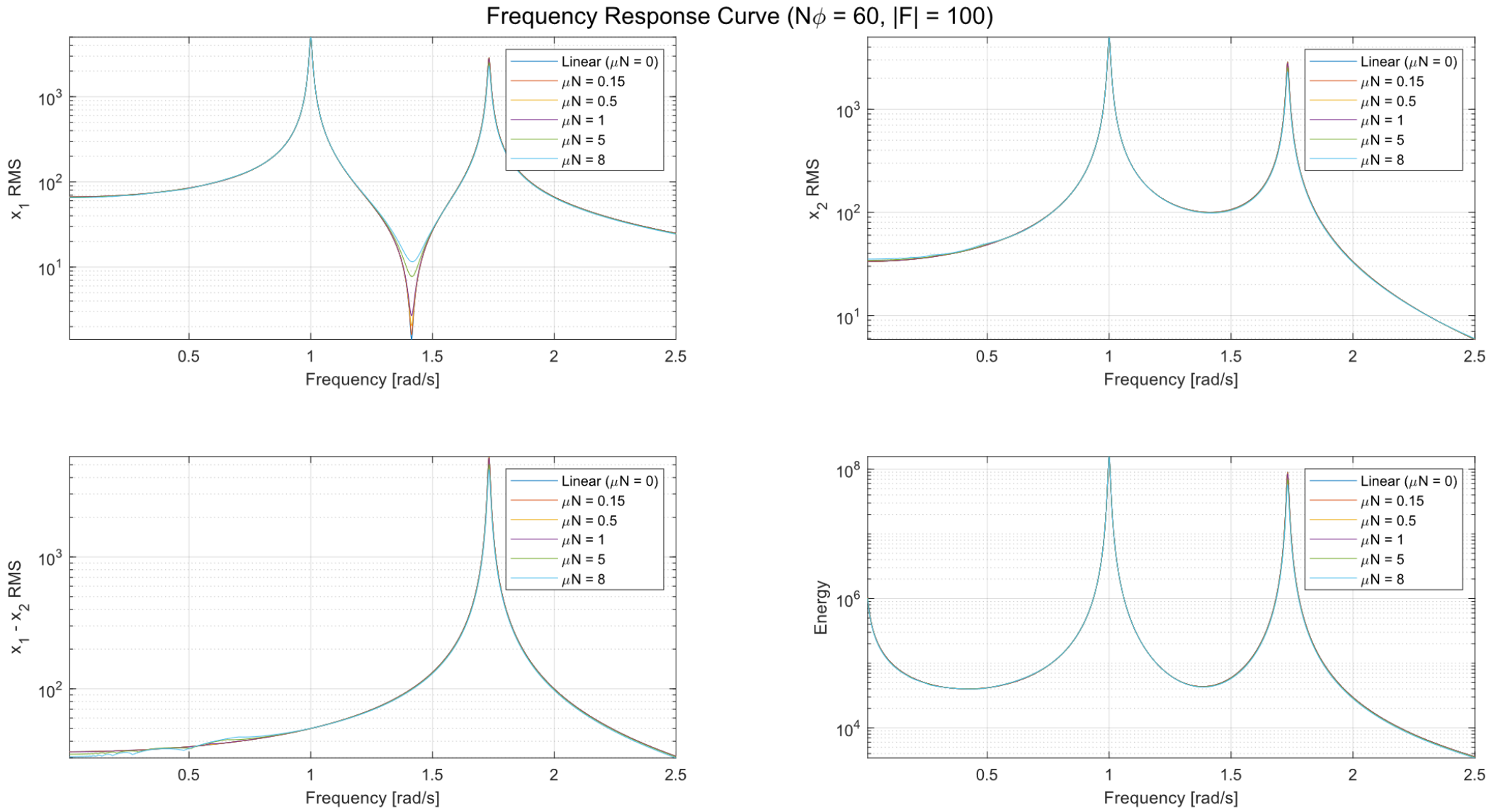
Superharmonic resonances for muN = 0.5 at: 0.656, 0.418, 0.263, 0.183 rad/s

Superharmonic resonances for muN = 1 at: 0.737, 0.371, 0.225, 0.163 rad/s



Elapsed time without Jacobian: 1605s
Elapsed time with Jacobian: 1100s

Frequencies: 0.01:0.001:2.5



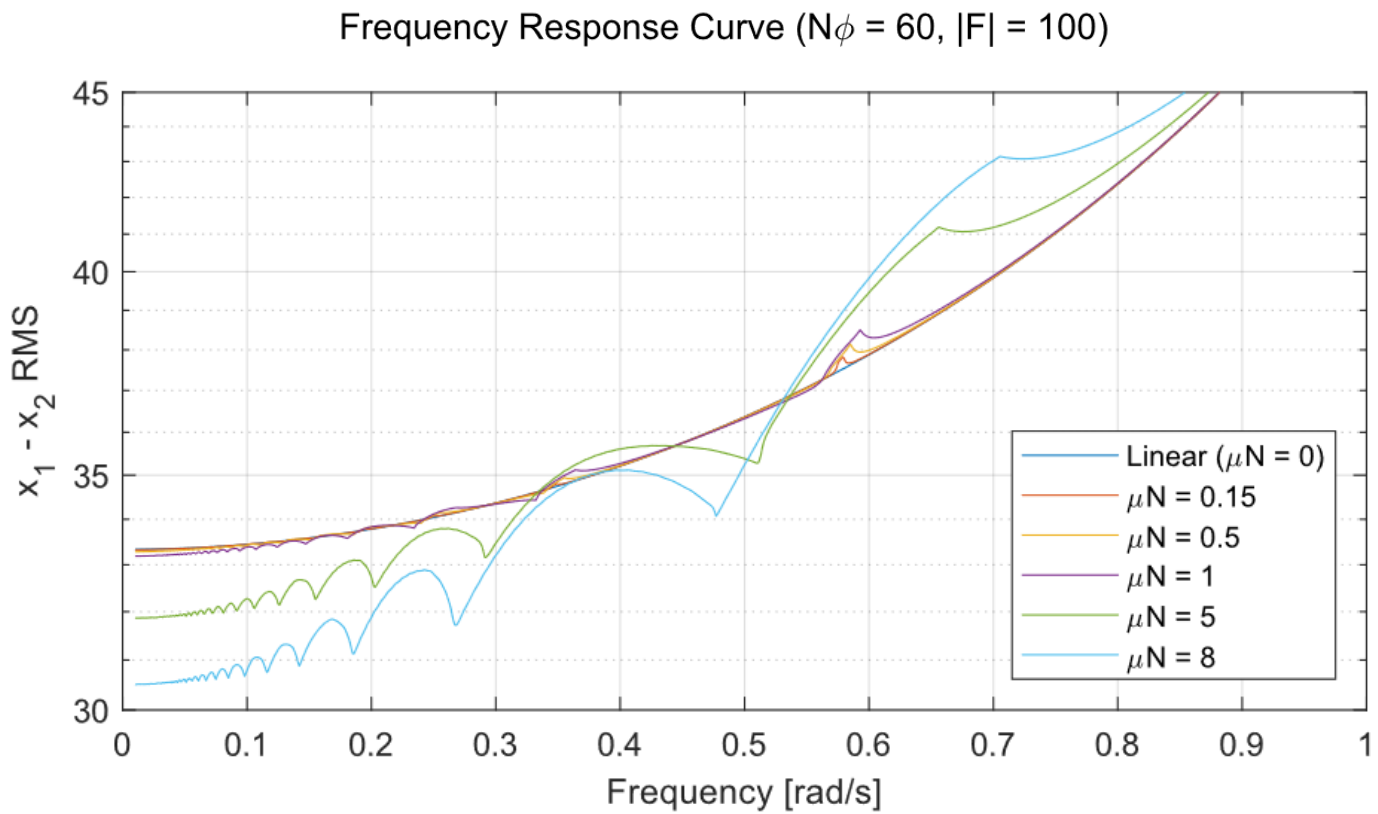
Superharmonic resonances for muN = 0.15 at: 0.579, 0.349, 0.25, 0.13rad/s

Superharmonic resonances for muN = 0.5 at: 0.585, 0.355, 0.257, 0.203rad/s

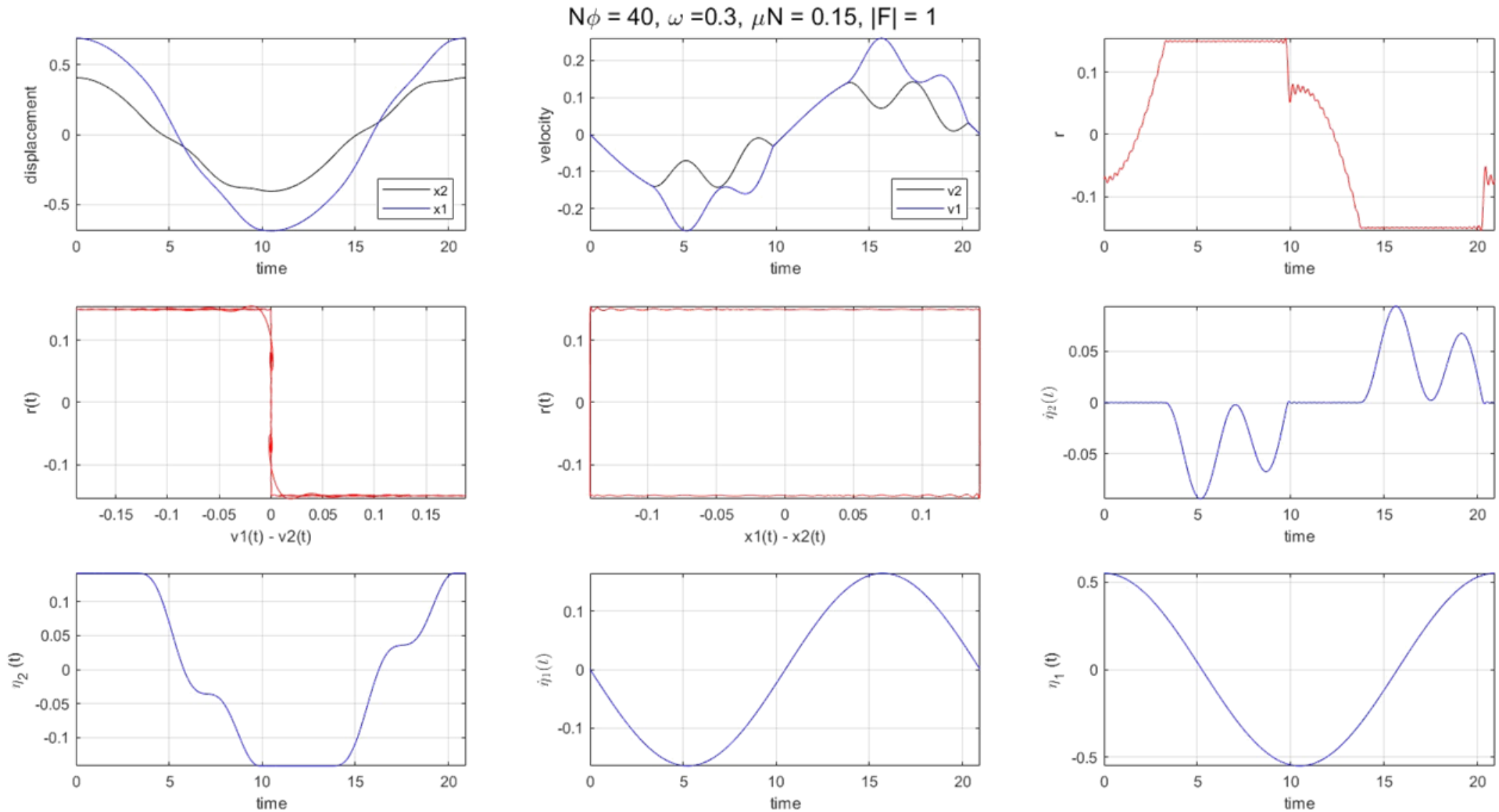
Superharmonic resonances for muN = 1 at: 0.593, 0.364, 0.268, 0.215rad/s

Superharmonic resonances for muN = 5 at: 0.656, 0.418, 0.263, 0.189rad/s

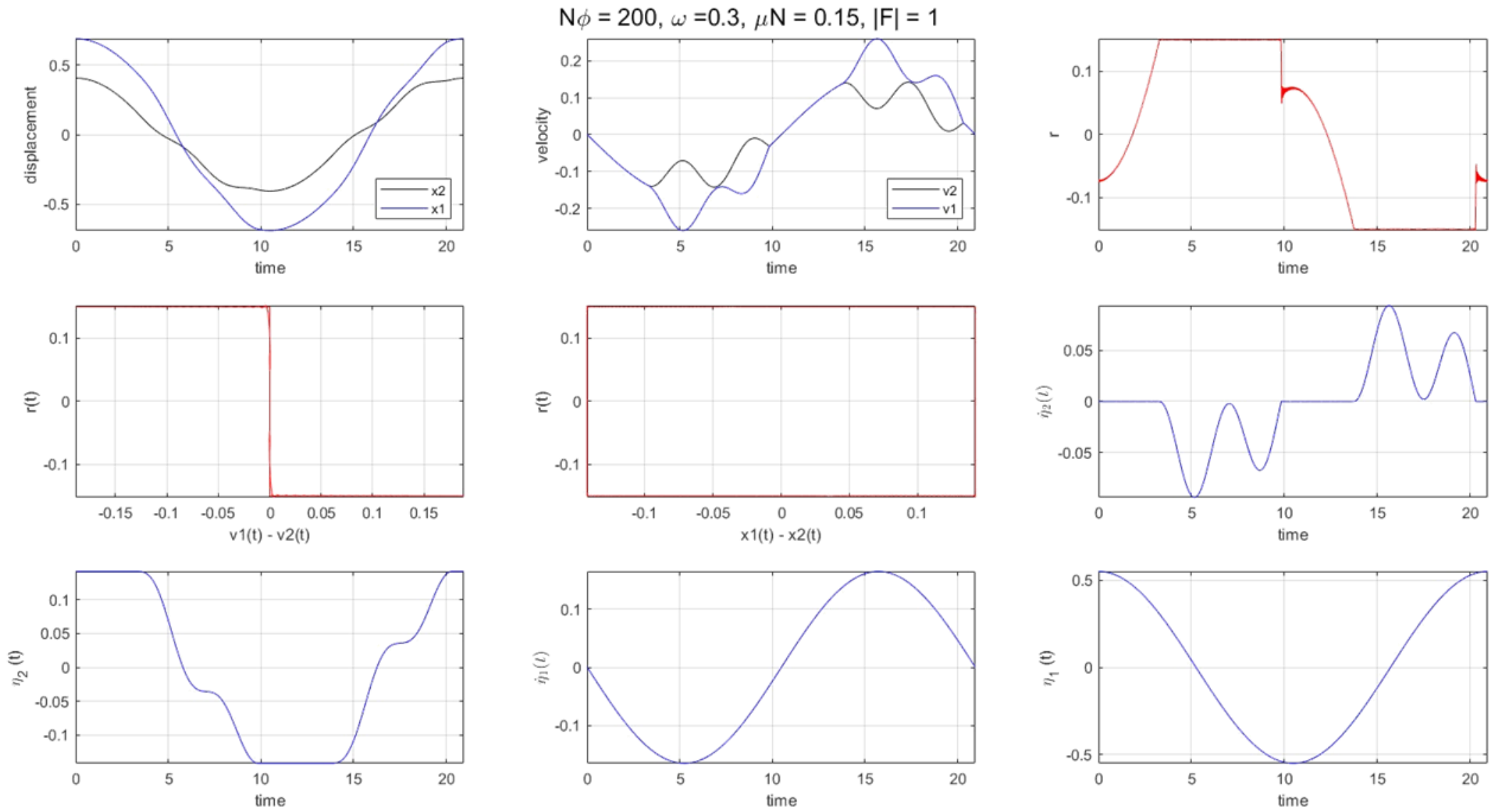
Superharmonic resonances for muN = 8 at: 0.704, 0.392, 0.248, 0.171rad/s



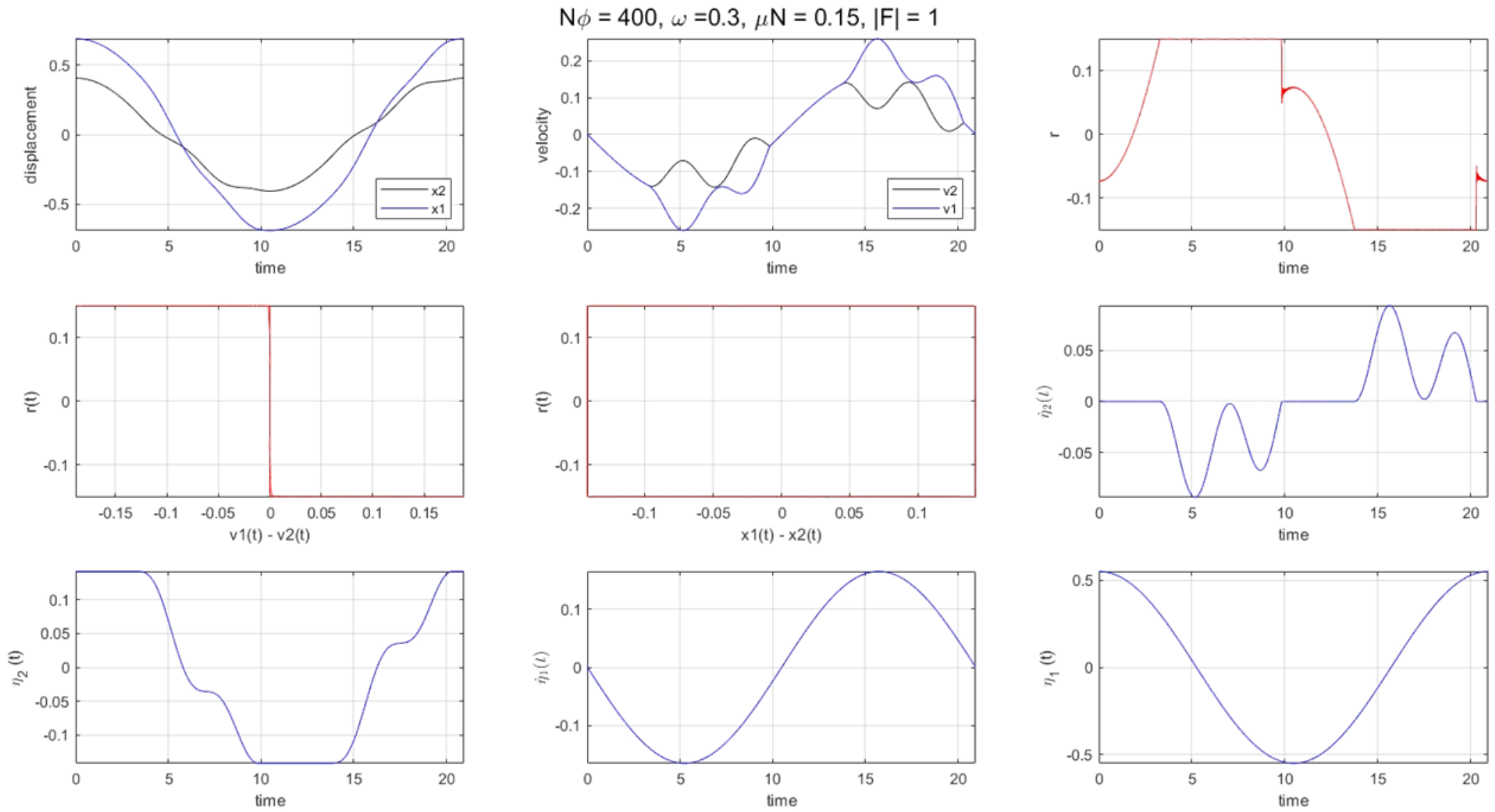
Elapsed time for time frequency domain solver: 0.5s



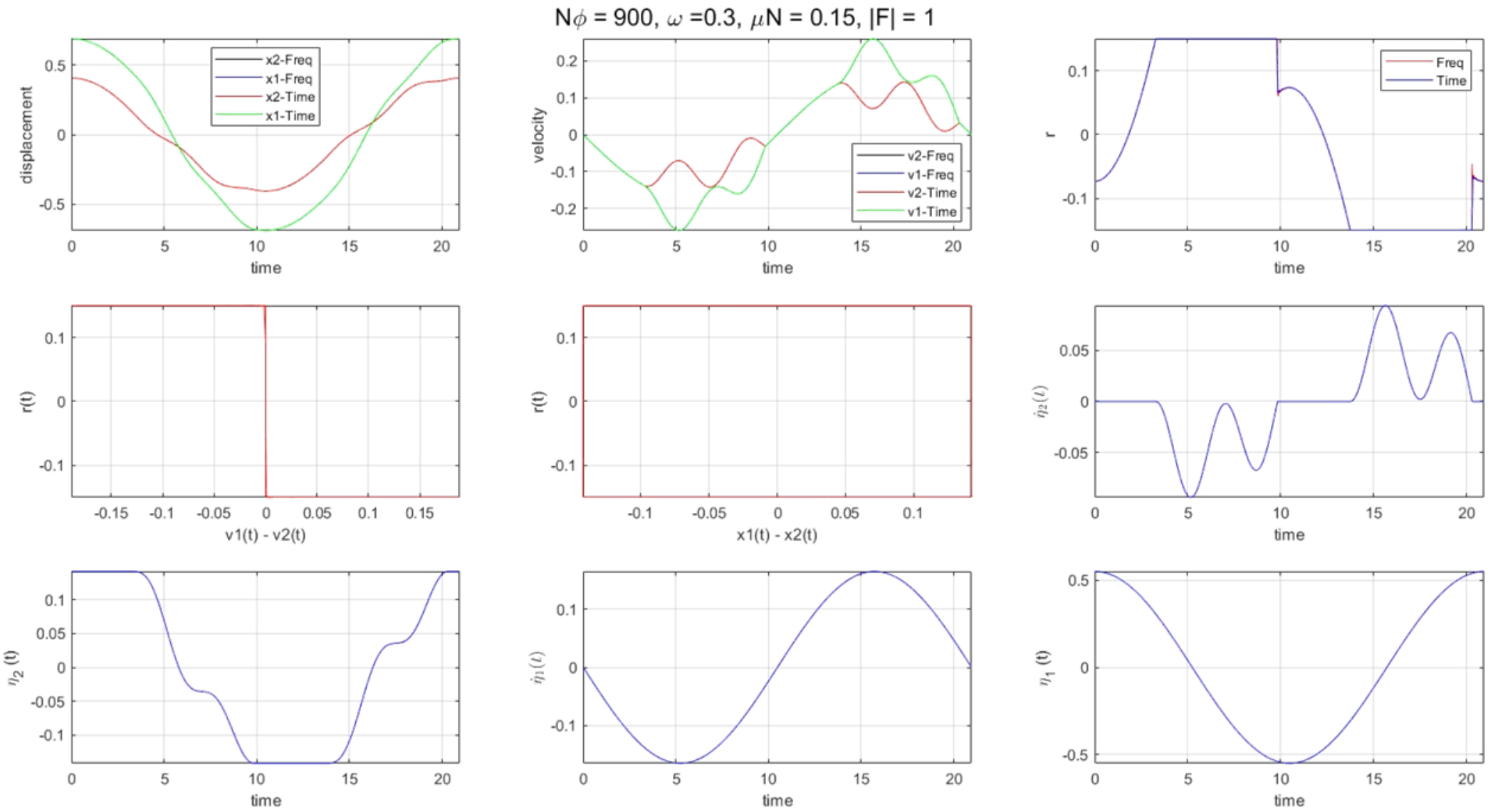
Elapsed time for time frequency domain solver from scratch: 11s
Elapsed time for time frequency domain solver using previous results: 2s

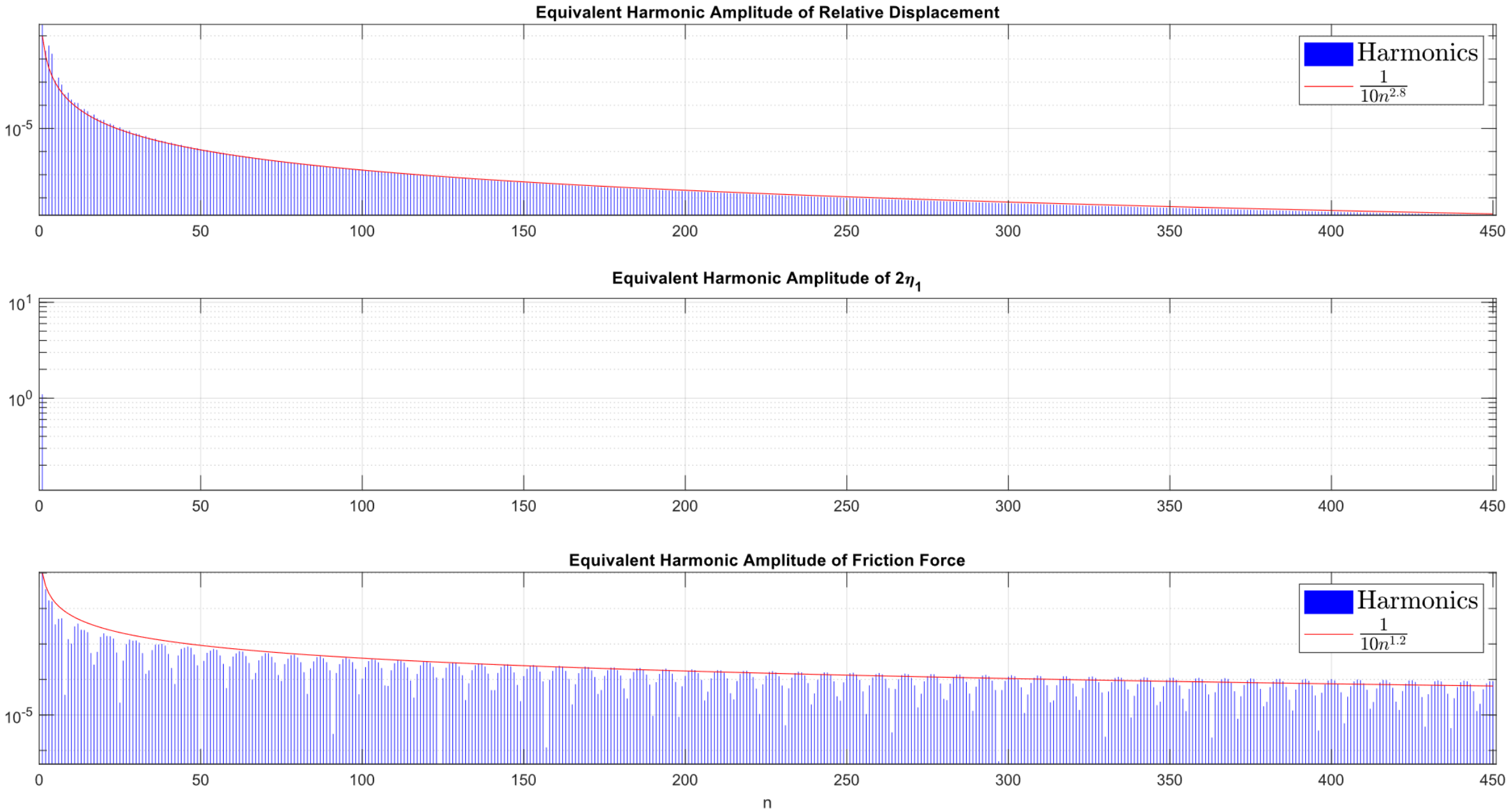


Elapsed time for time frequency domain solver from scratch: 65s
Elapsed time for time frequency domain solver using previous results: 6.4s

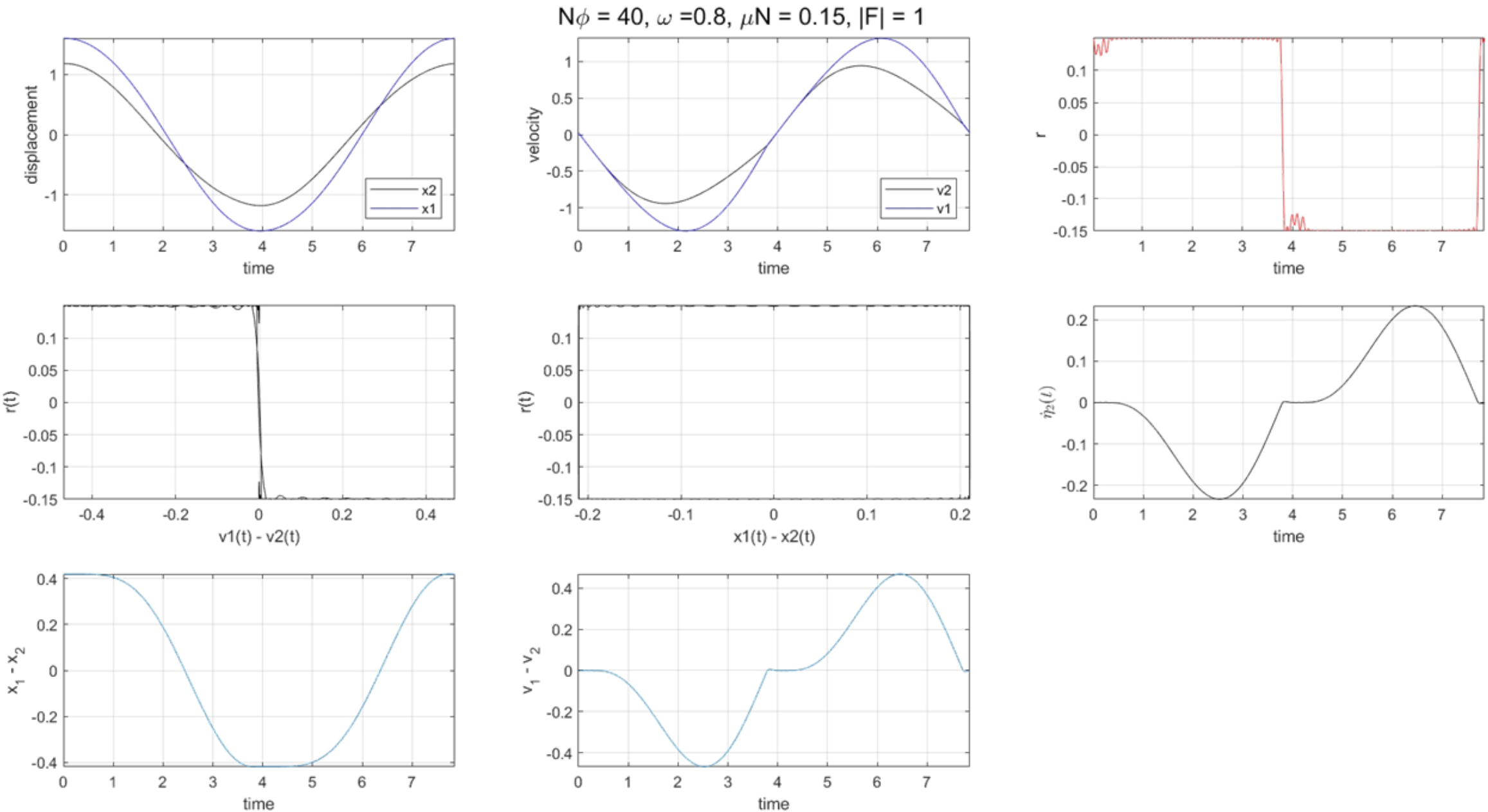


Elapsed time for time domain solver: 2000s
Elapsed time for frequency domain solver: 62s

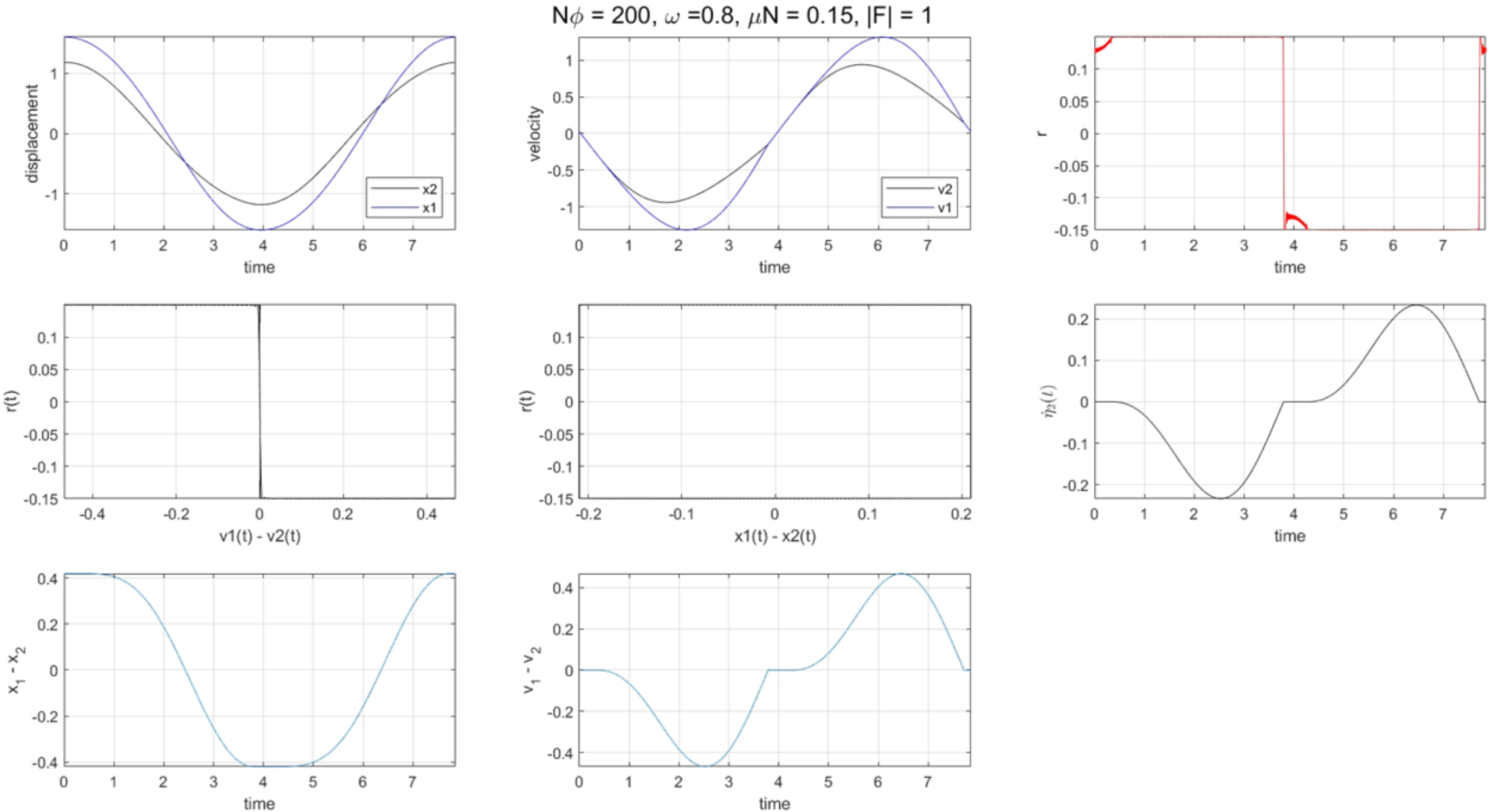



Equivalent Harmonic Amplitude of Relative Displacement
Harmonics
$\frac{1}{10n^{2.8}}$
10^{-5}
0
50
100
150
200
250
300
350
400
450
Equivalent Harmonic Amplitude of $2\eta_1$
10^{1}
10^{0}
0
50
100
150
200
250
300
350
400
450
Equivalent Harmonic Amplitude of Friction Force
Harmonics
$\frac{1}{10n^{1.2}}$
10^{-5}
0
50
100
150
200
250
300
350
400
450
n

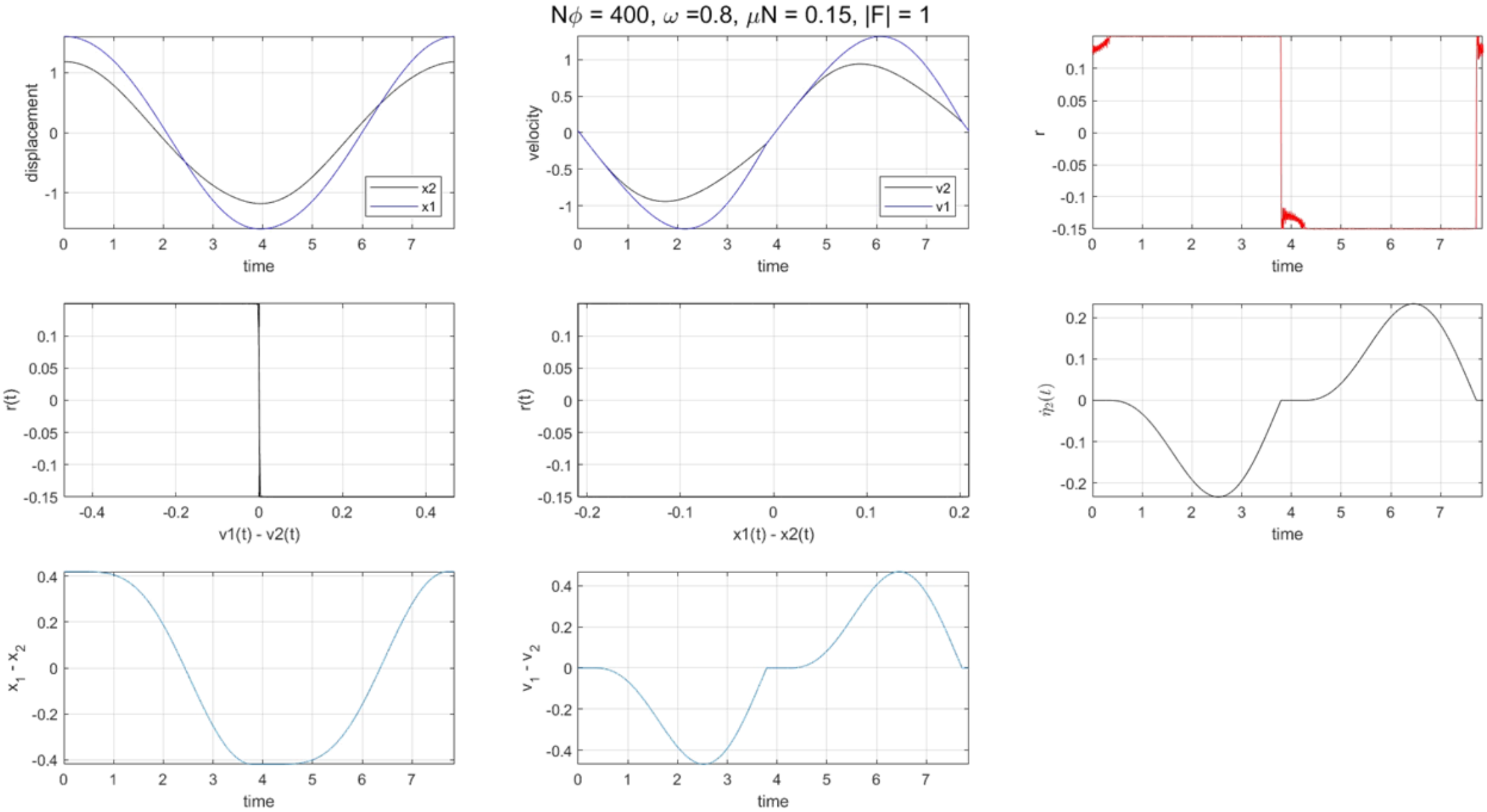
Elapsed time for time frequency domain solver: 0.8s



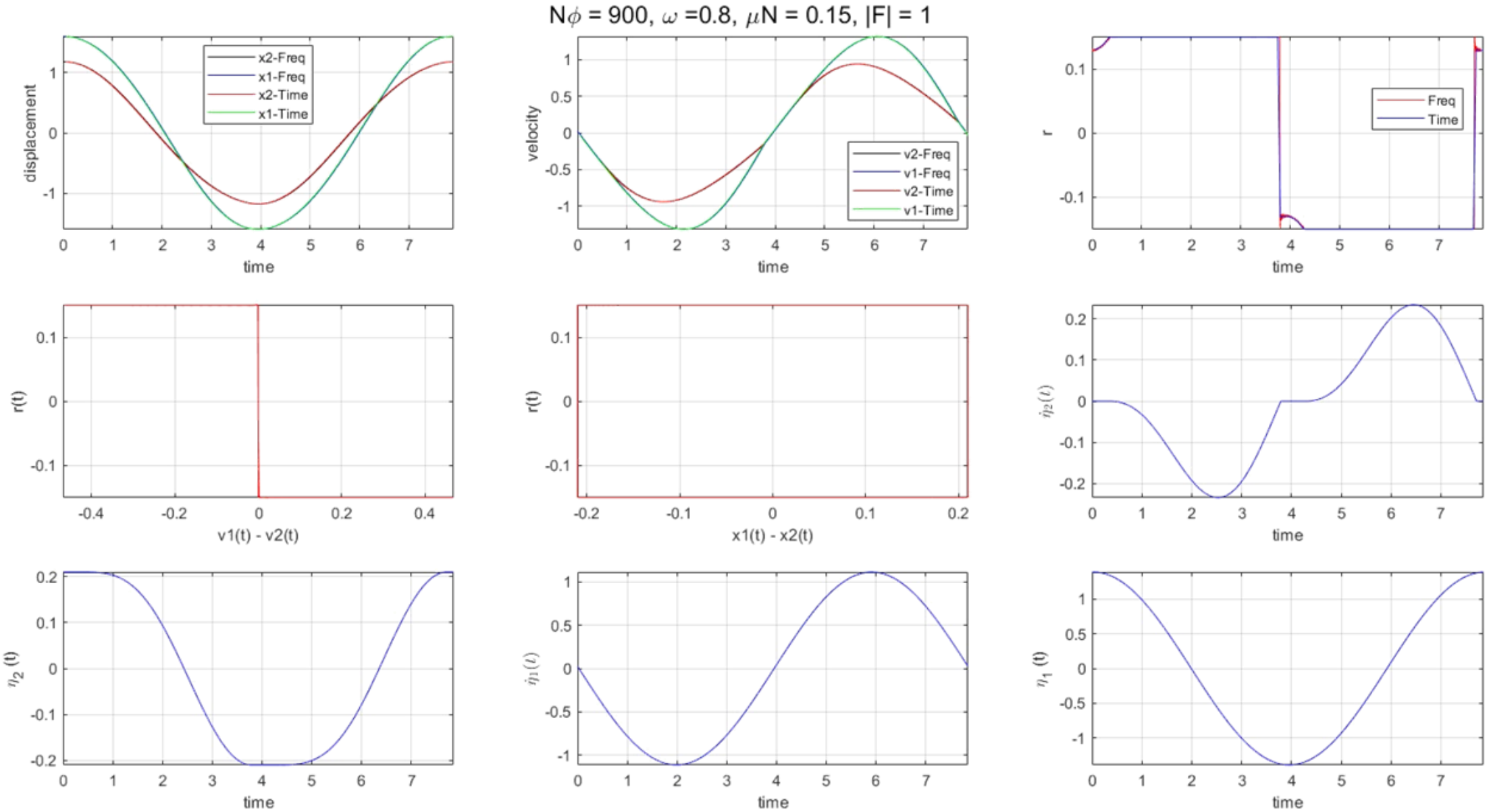
Elapsed time for time frequency domain solver from scratch: 20s
Elapsed time for time frequency domain solver using previous results: 6.7s

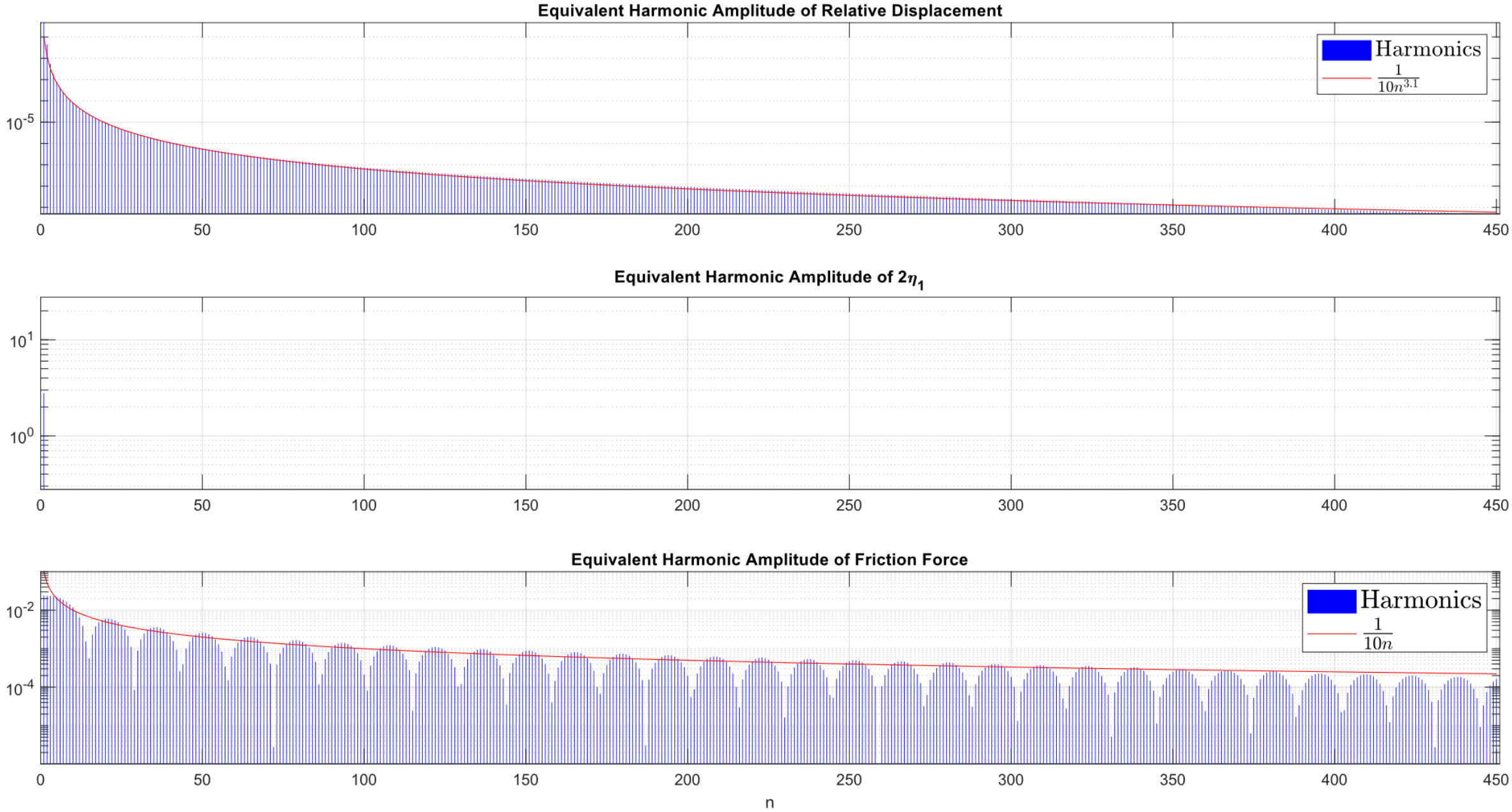


Elapsed time for time frequency domain solver from scratch: ---
Elapsed time for time frequency domain solver using previous results: 19.9s

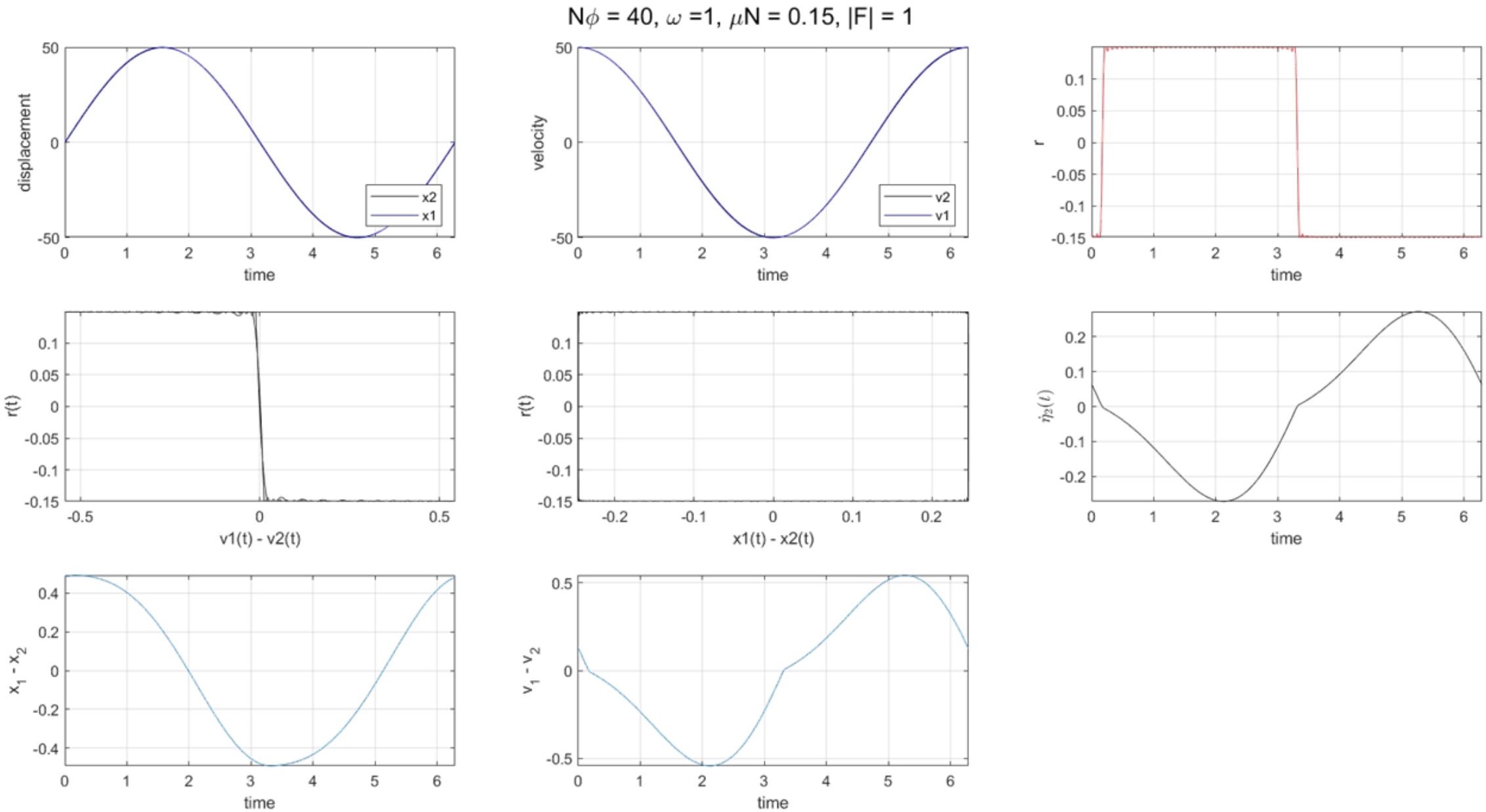


Elapsed time for time domain solver: 2100s
Elapsed time for frequency domain solver: 160s

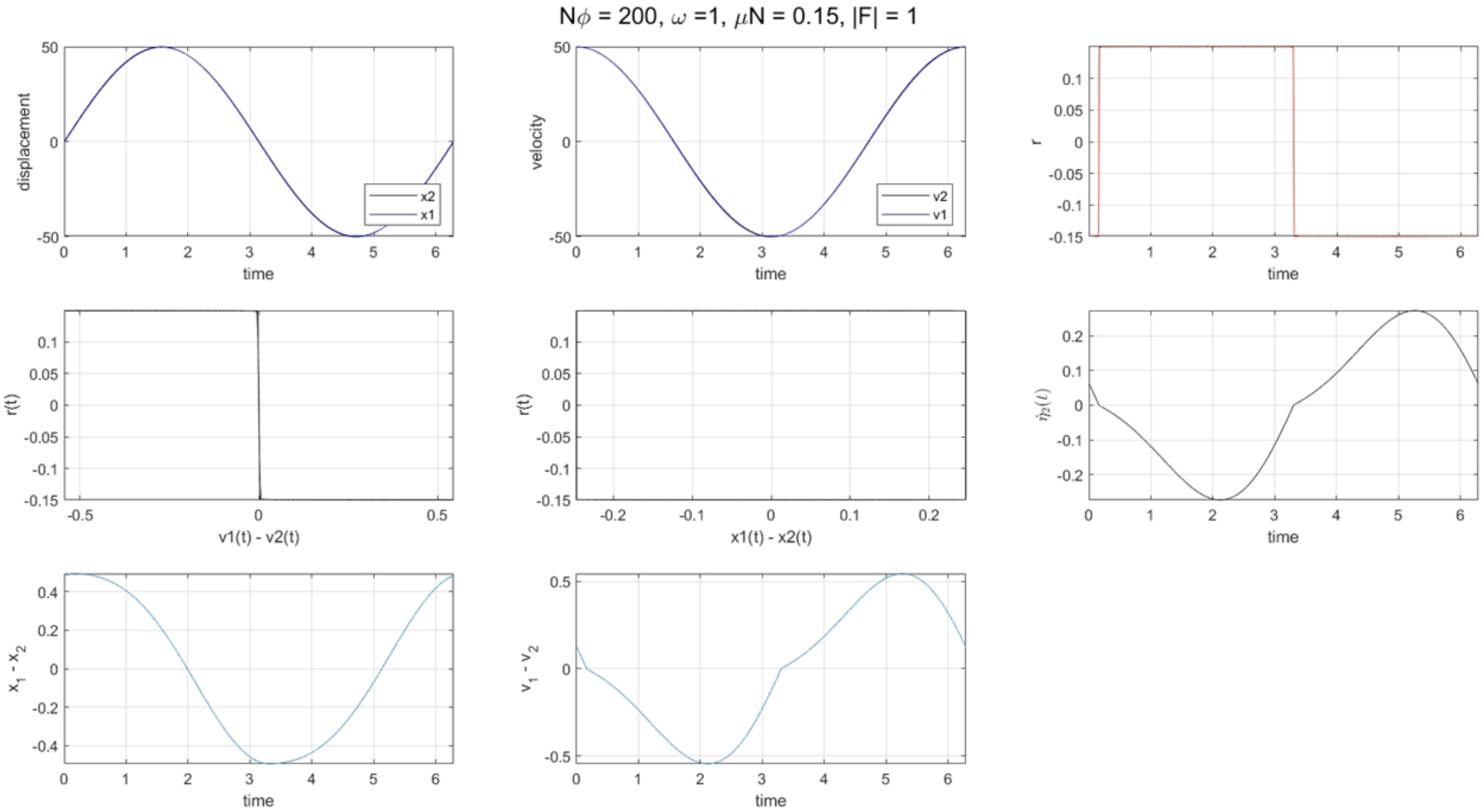



Equivalent Harmonic Amplitude of Relative Displacement
Harmonics
$\frac{1}{10n^{3.1}}$
10^{-5}
0
50
100
150
200
250
300
350
400
450
Equivalent Harmonic Amplitude of $2\eta_1$
10^{1}
10^{0}
0
50
100
150
200
250
300
350
400
450
Equivalent Harmonic Amplitude of Friction Force
Harmonics
$\frac{1}{10n}$
10^{-2}
10^{-4}
0
50
100
150
200
250
300
350
400
450
n

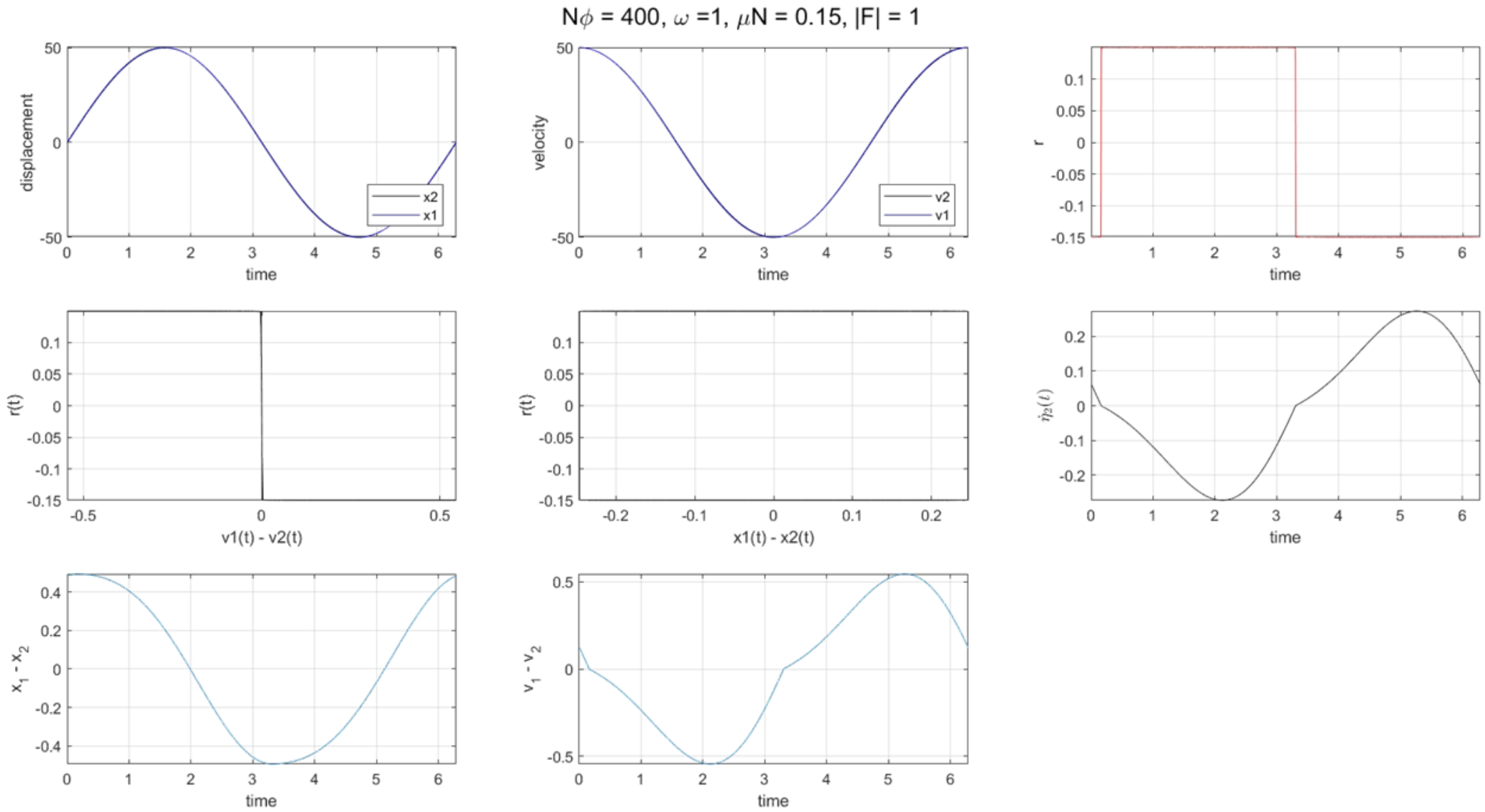
Elapsed time for time frequency domain solver: 0.8s



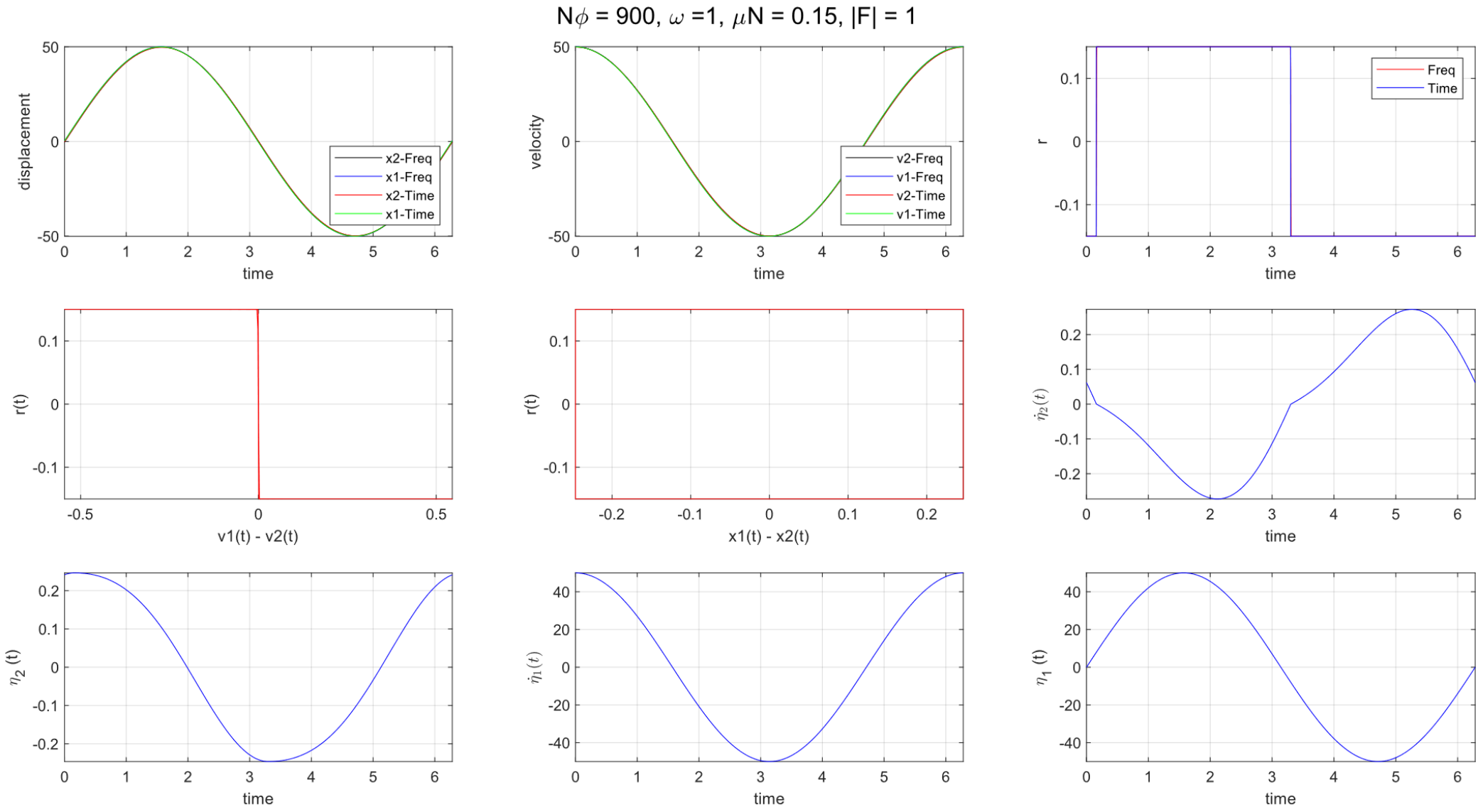
Elapsed time for time frequency domain solver from scratch: 84s
Elapsed time for time frequency domain solver using previous results: 4.7s

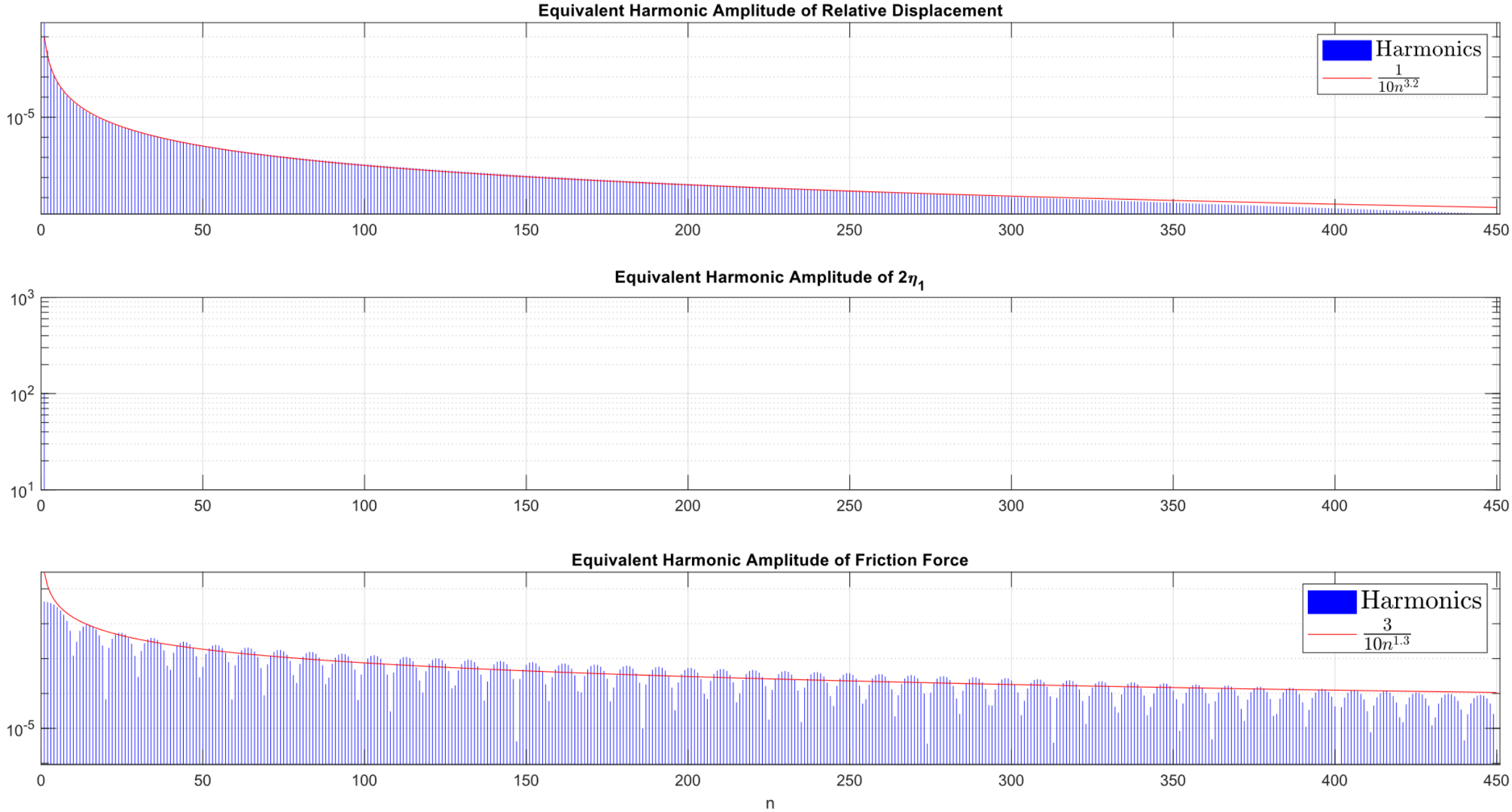


Elapsed time for time frequency domain solver from scratch: ---s
Elapsed time for time frequency domain solver using previous results: 10s

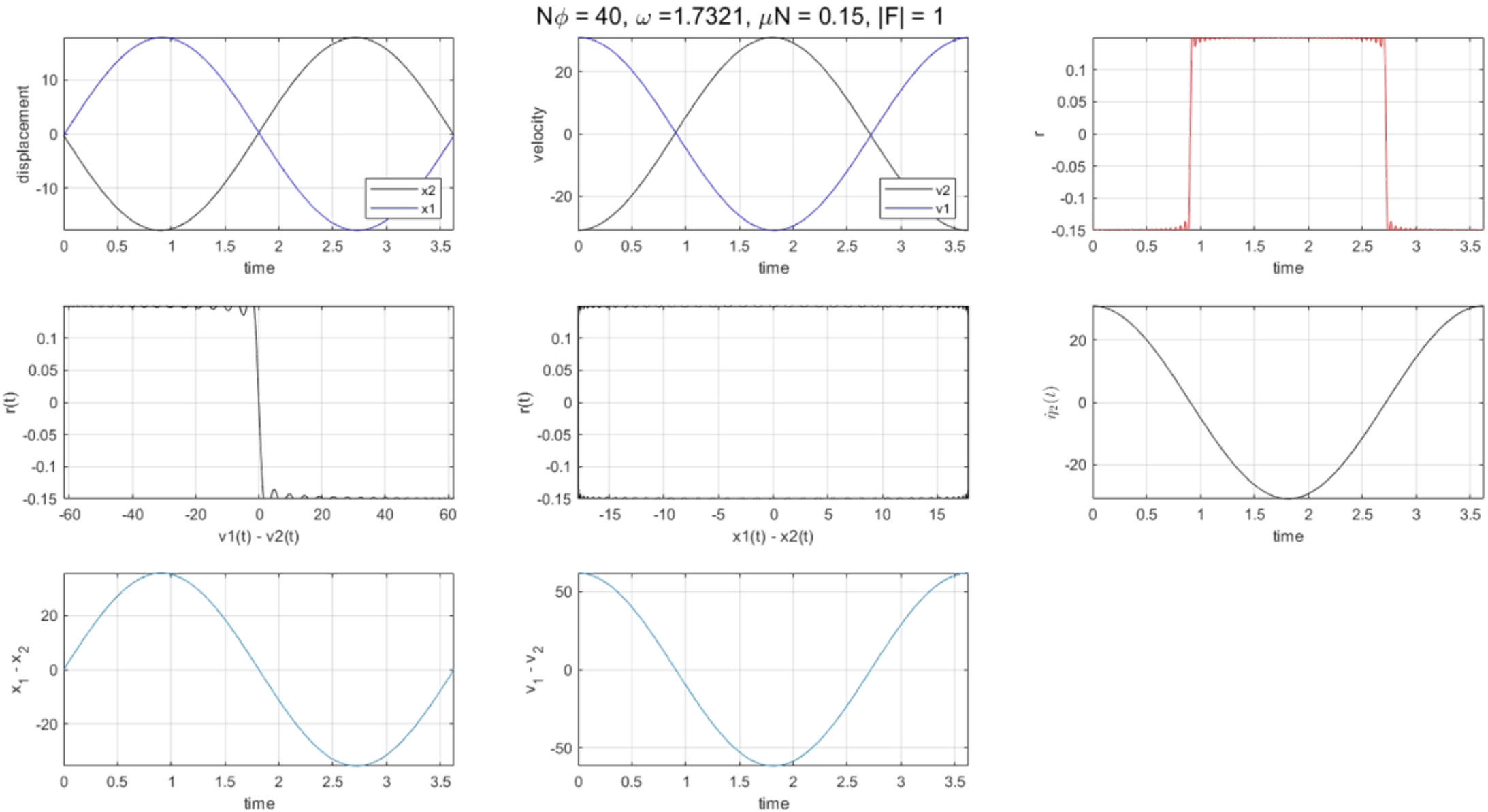


Elapsed time for time domain solver: 22745s
Elapsed time for frequency domain solver: 40s

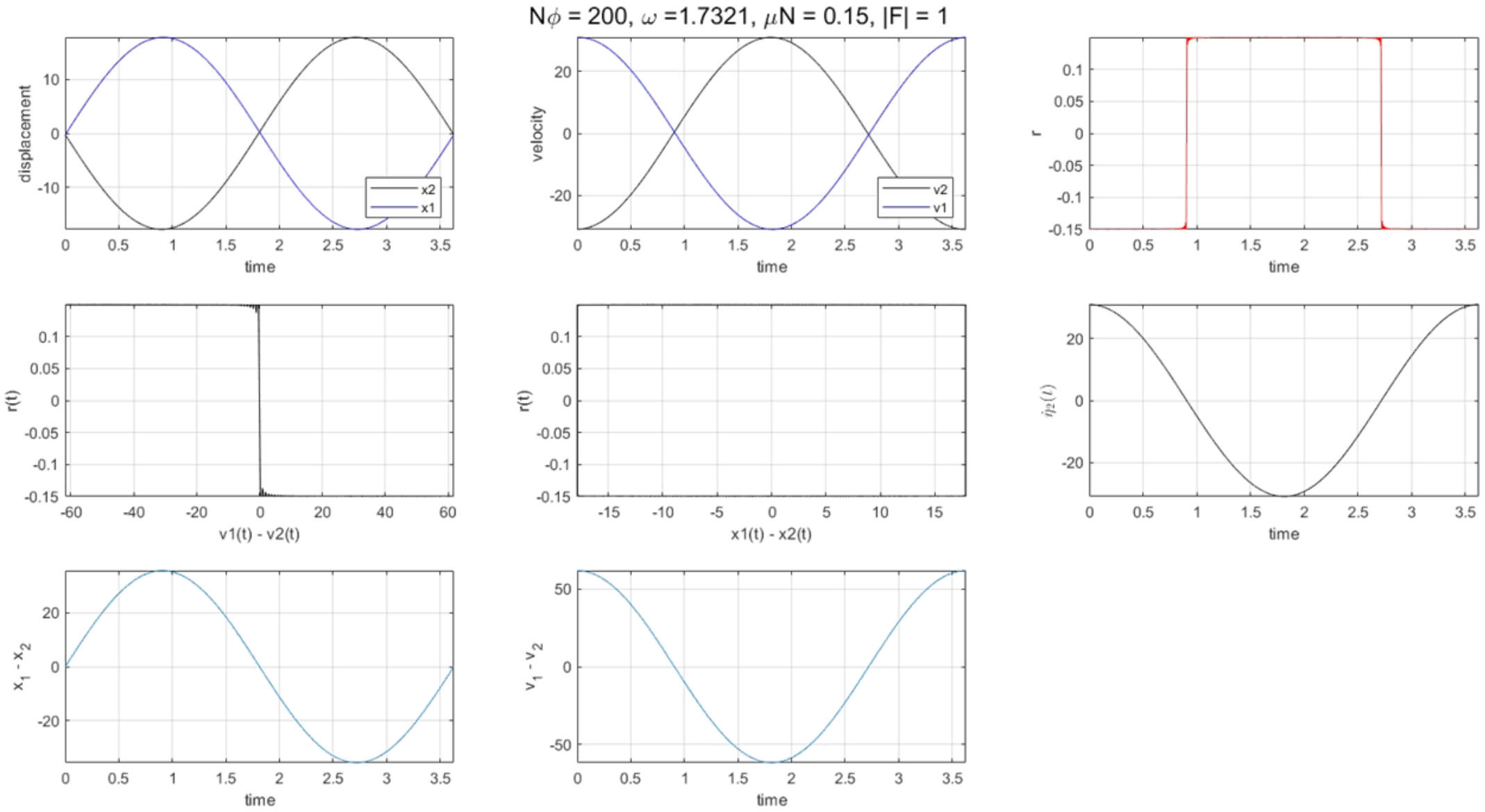



Equivalent Harmonic Amplitude of Relative Displacement
Harmonics
$\frac{1}{10n^{3.2}}$
10^{-5}
0
50
100
150
200
250
300
350
400
450
Equivalent Harmonic Amplitude of $2\eta_1$
10^3
10^2
10^1
0
50
100
150
200
250
300
350
400
450
Equivalent Harmonic Amplitude of Friction Force
Harmonics
$\frac{3}{10n^{1.3}}$
10^{-5}
0
50
100
150
200
250
300
350
400
450
n

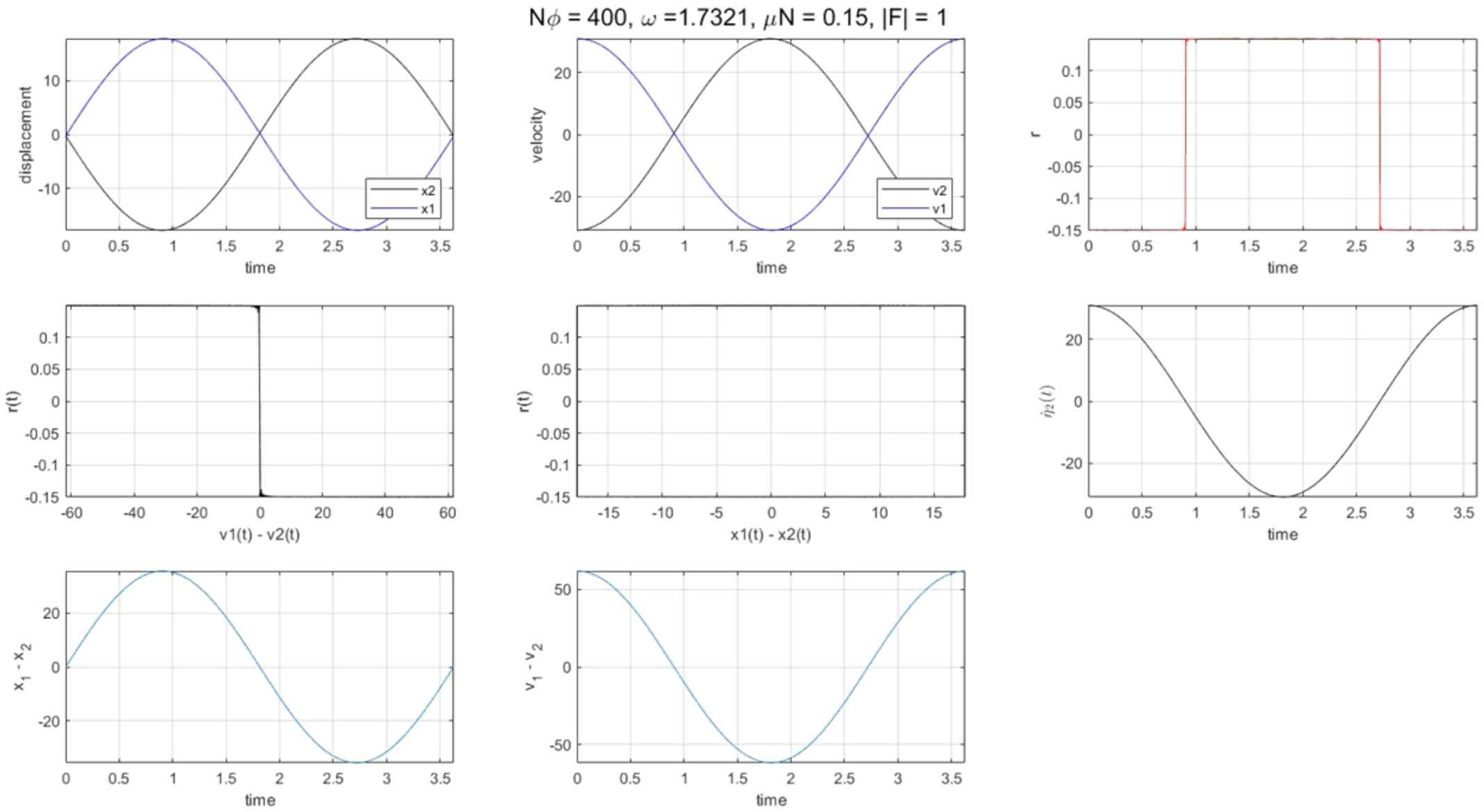
Elapsed time for time frequency domain solver: 0.13s



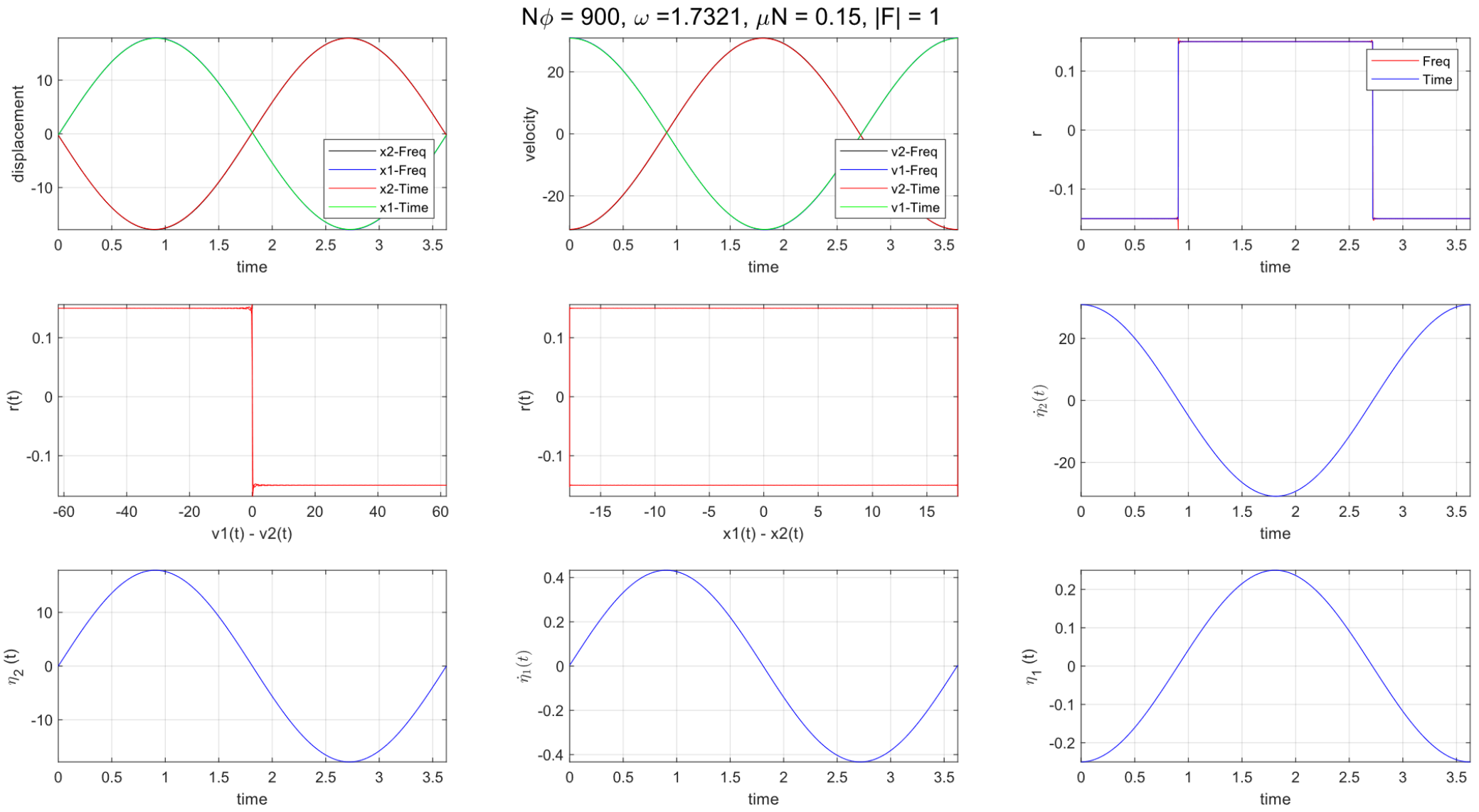
Elapsed time for time frequency domain solver from scratch: 0.5s
Elapsed time for time frequency domain solver using previous results: 1s

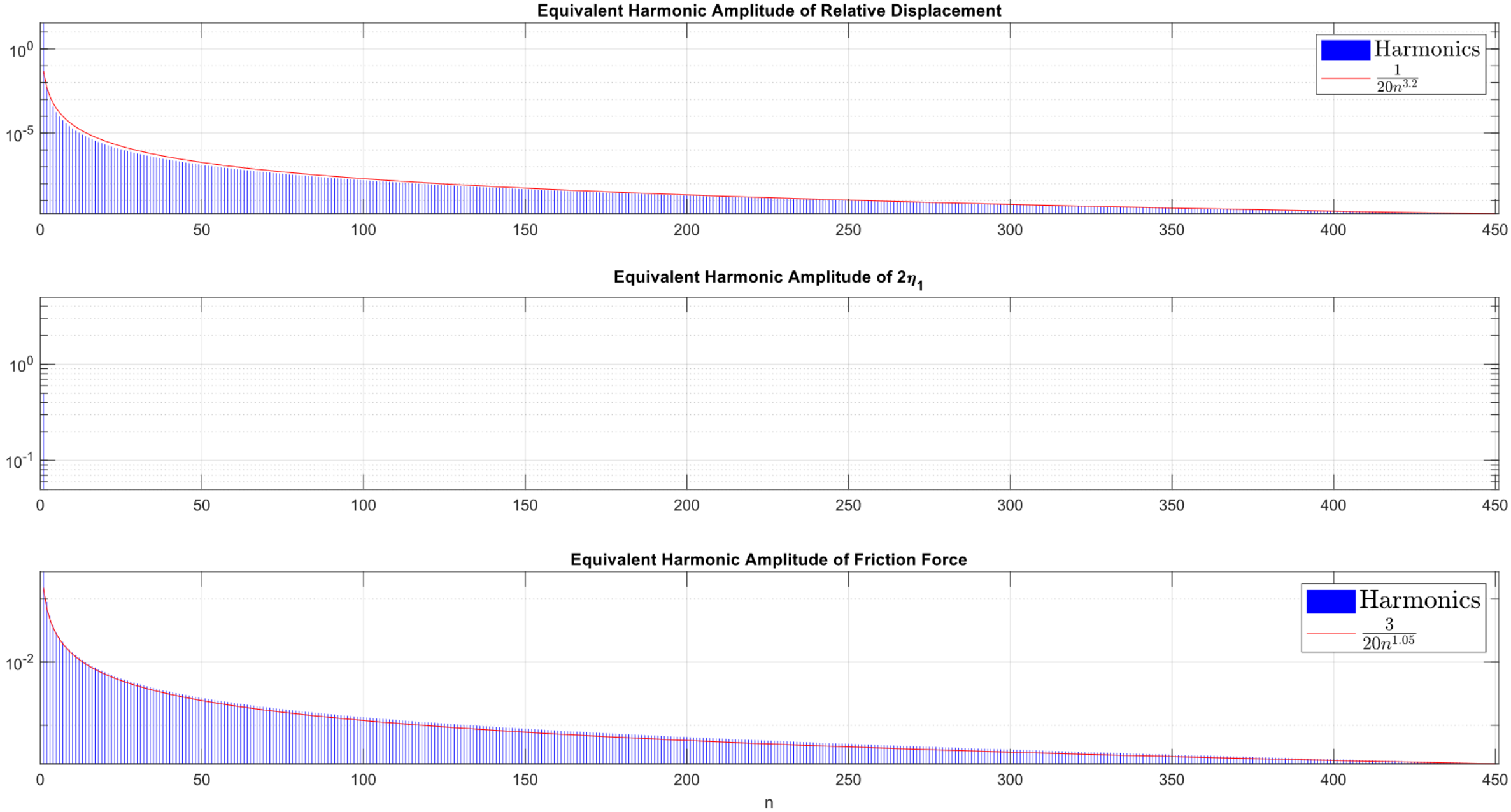


Elapsed time for time frequency domain solver from scratch: 1.2s
Elapsed time for time frequency domain solver using previous results: 2.4s

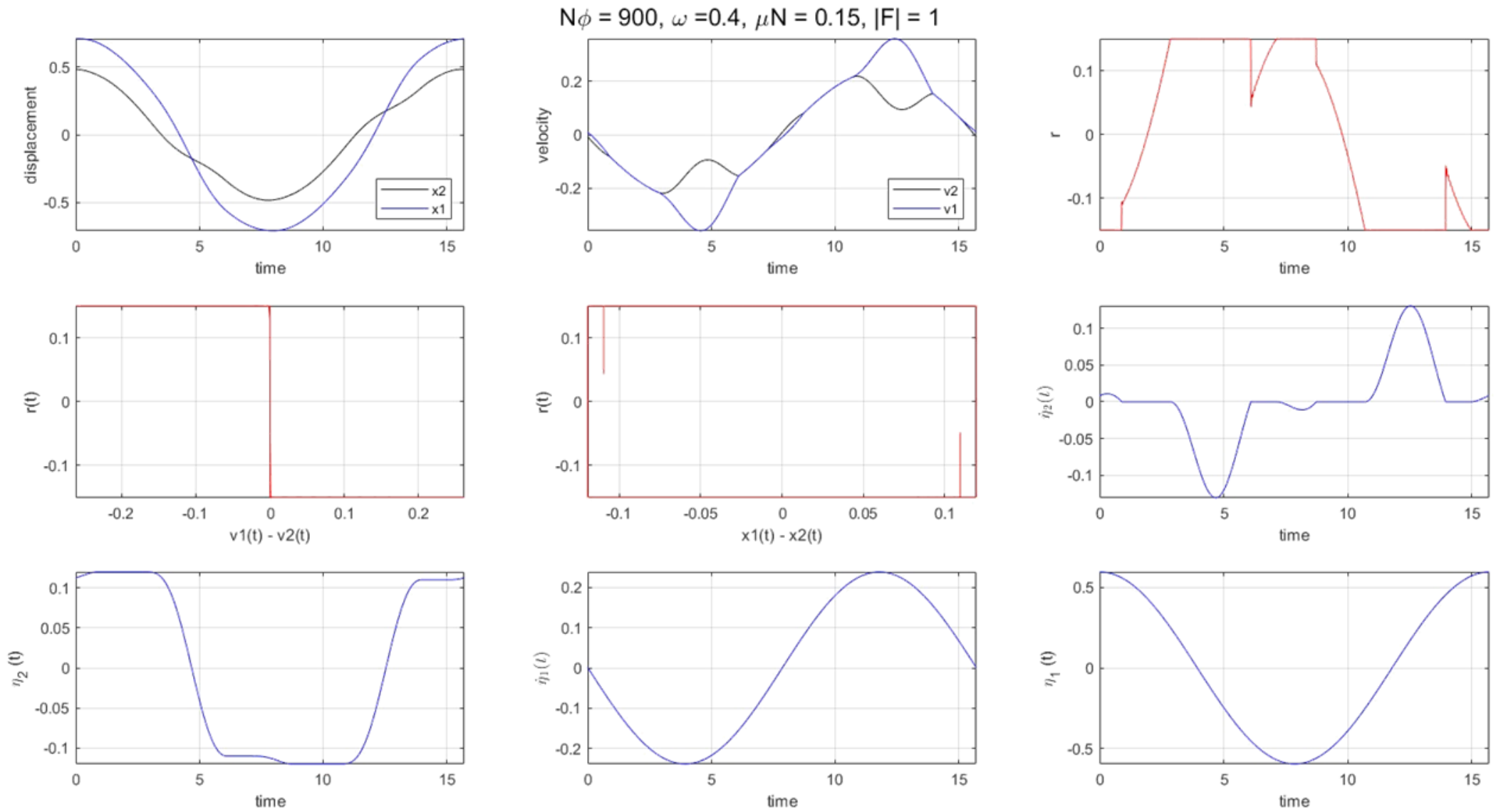


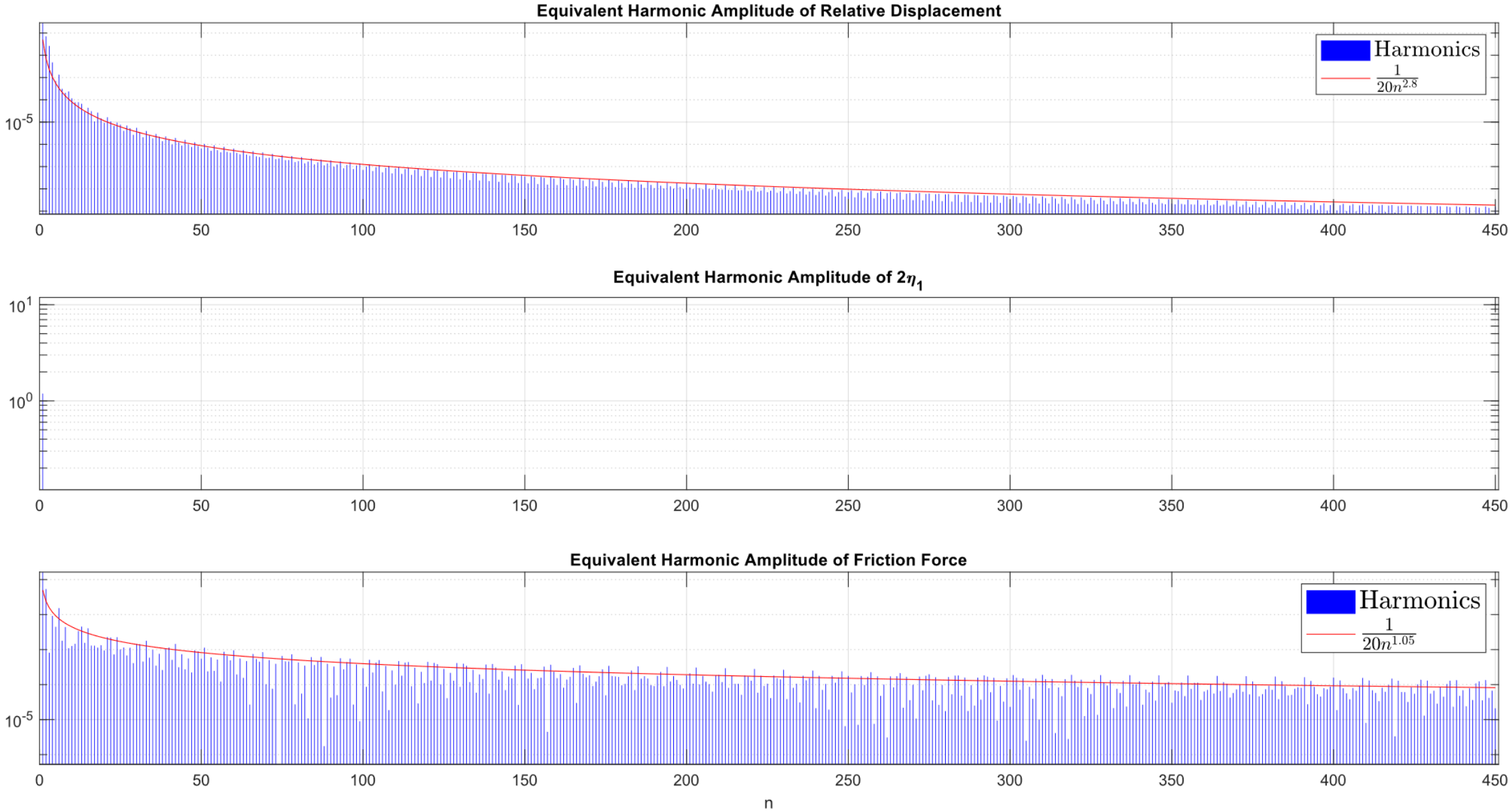
Elapsed time for time domain solver: 22335s
Elapsed time for frequency domain solver: 40s



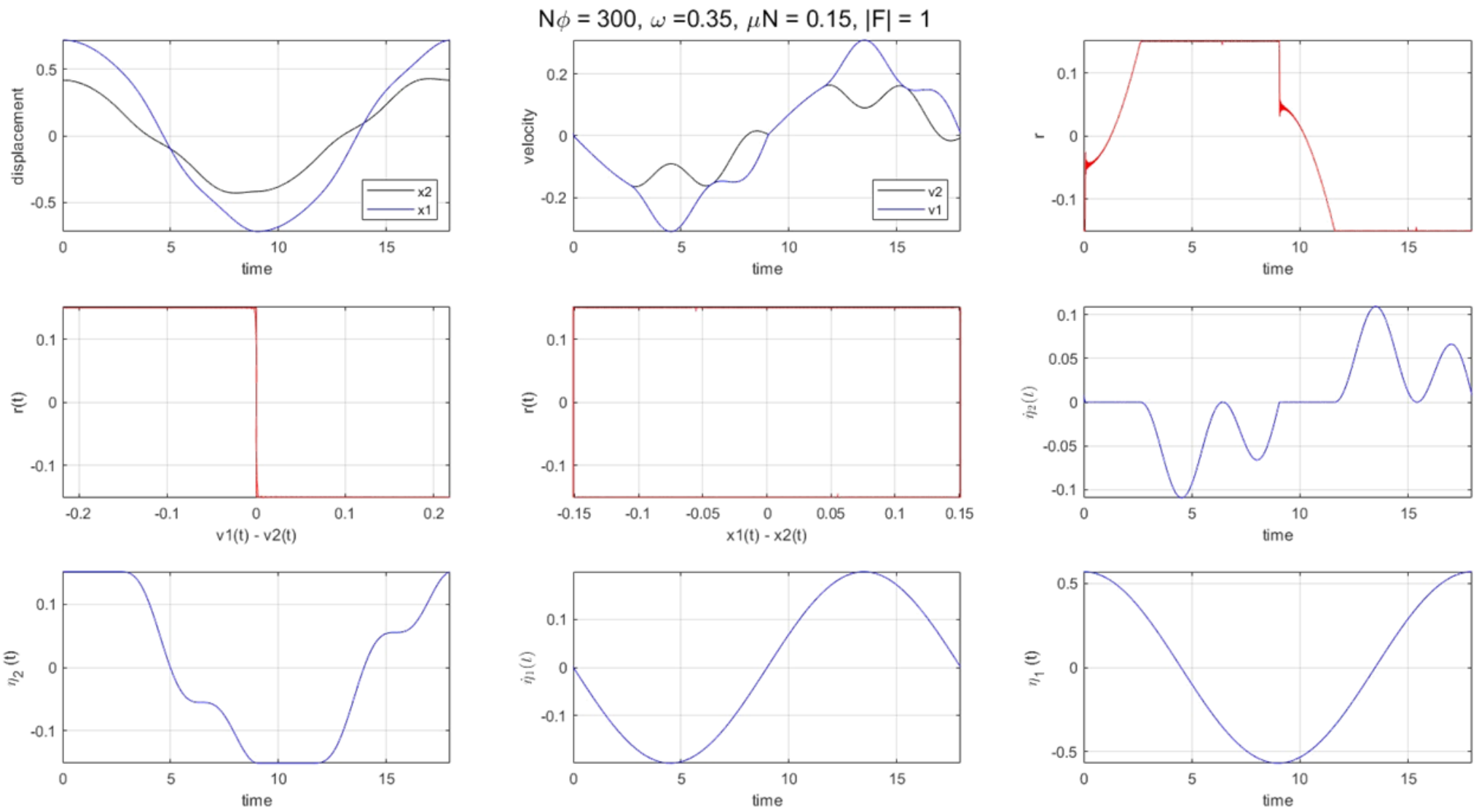

Equivalent Harmonic Amplitude of Relative Displacement
10^0
10^{-5}
Harmonics
$\frac{1}{20n^{3.2}}$
0
50
100
150
200
250
300
350
400
450
Equivalent Harmonic Amplitude of $2\eta_1$
10^0
10^{-1}
0
50
100
150
200
250
300
350
400
450
Equivalent Harmonic Amplitude of Friction Force
10^{-2}
Harmonics
$\frac{3}{20n^{1.05}}$
0
50
100
150
200
250
300
350
400
450
n

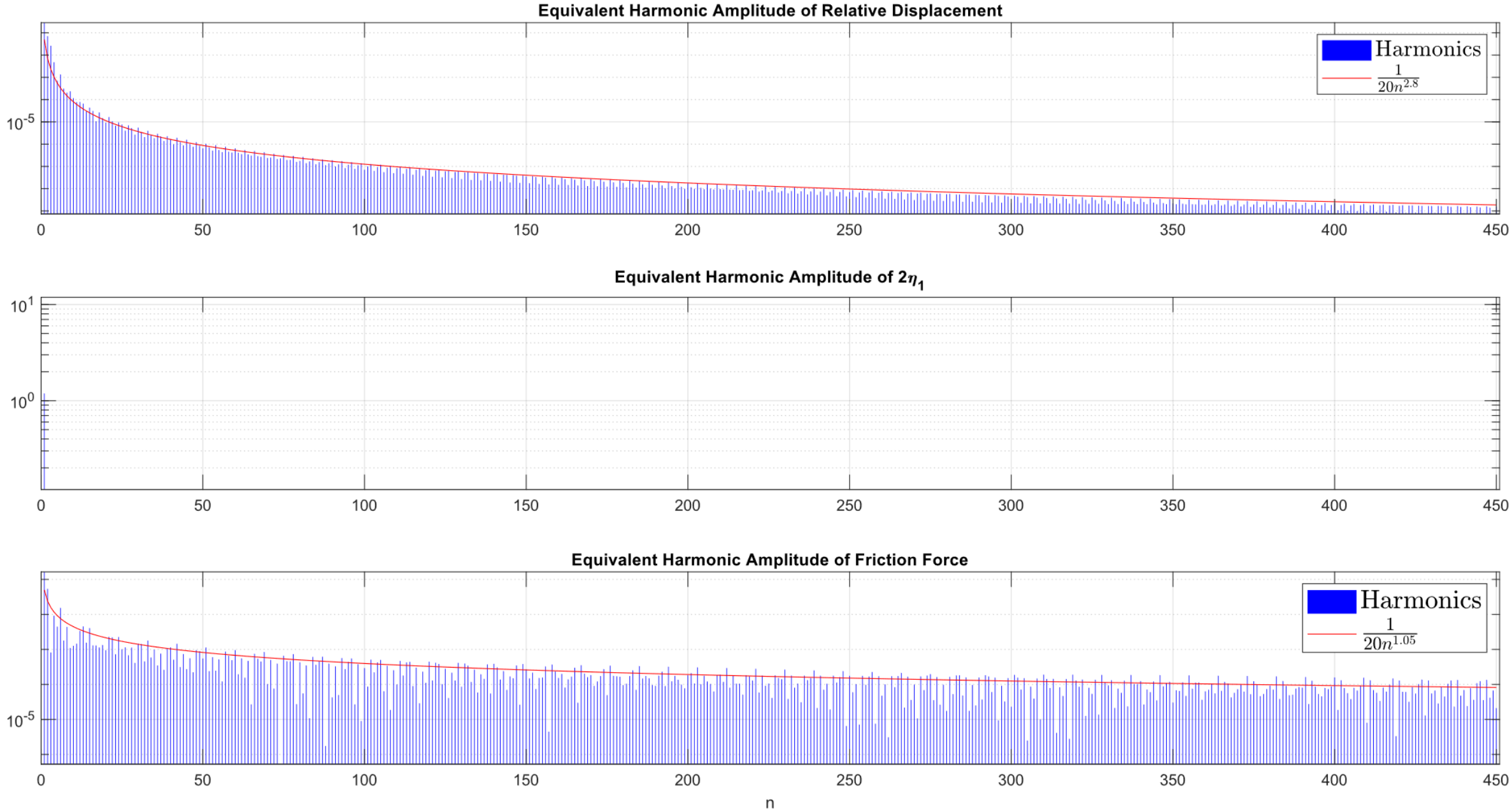
Elapsed time: 101s
First Antiresonance



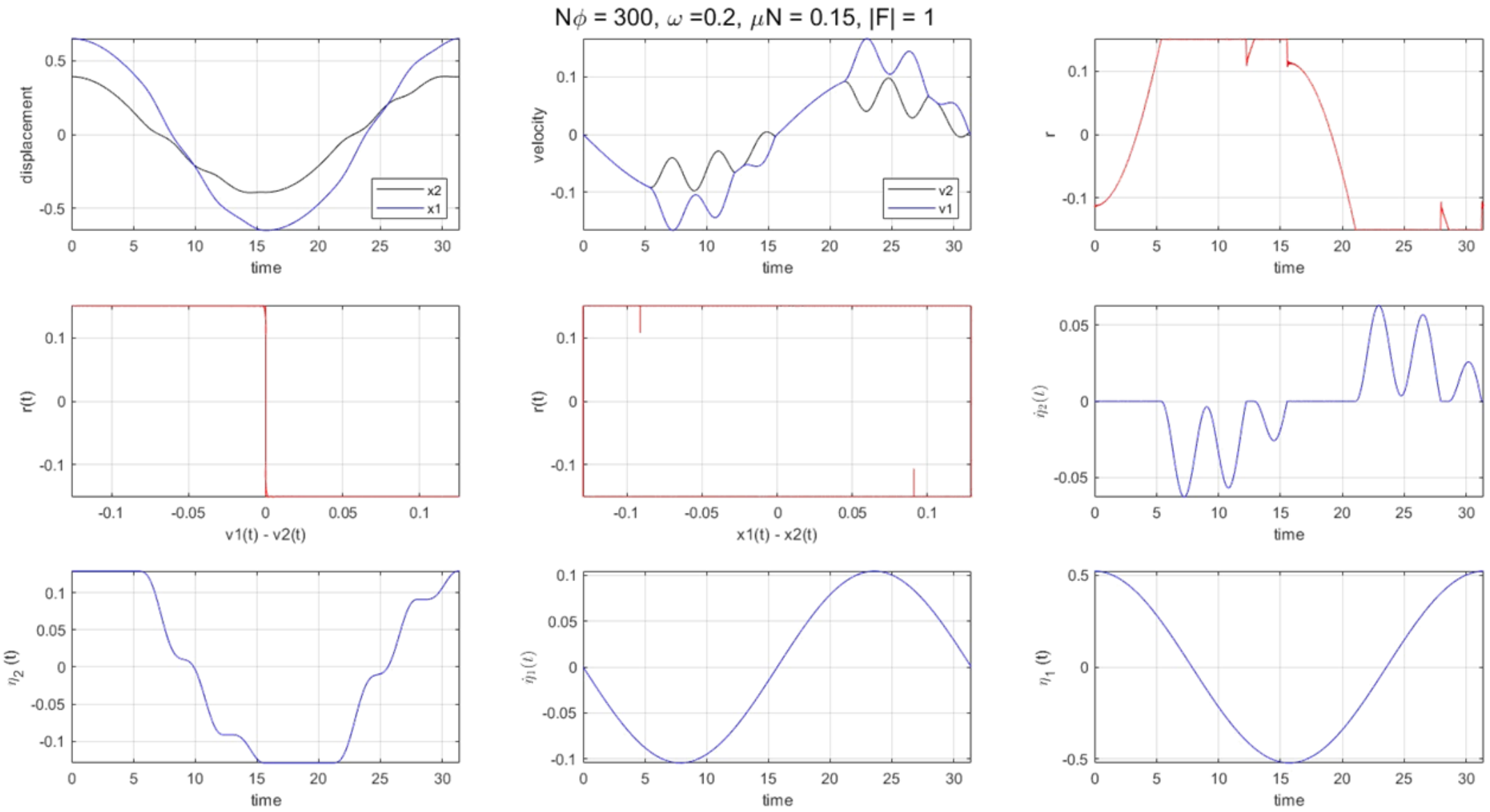

Equivalent Harmonic Amplitude of Relative Displacement
Harmonics
$\frac{1}{20n^{2.8}}$
10^{-5}
0
50
100
150
200
250
300
350
400
450
Equivalent Harmonic Amplitude of $2\eta_1$
10^{1}
10^{0}
0
50
100
150
200
250
300
350
400
450
Equivalent Harmonic Amplitude of Friction Force
Harmonics
$\frac{1}{20n^{1.05}}$
10^{-5}
0
50
100
150
200
250
300
350
400
450
n

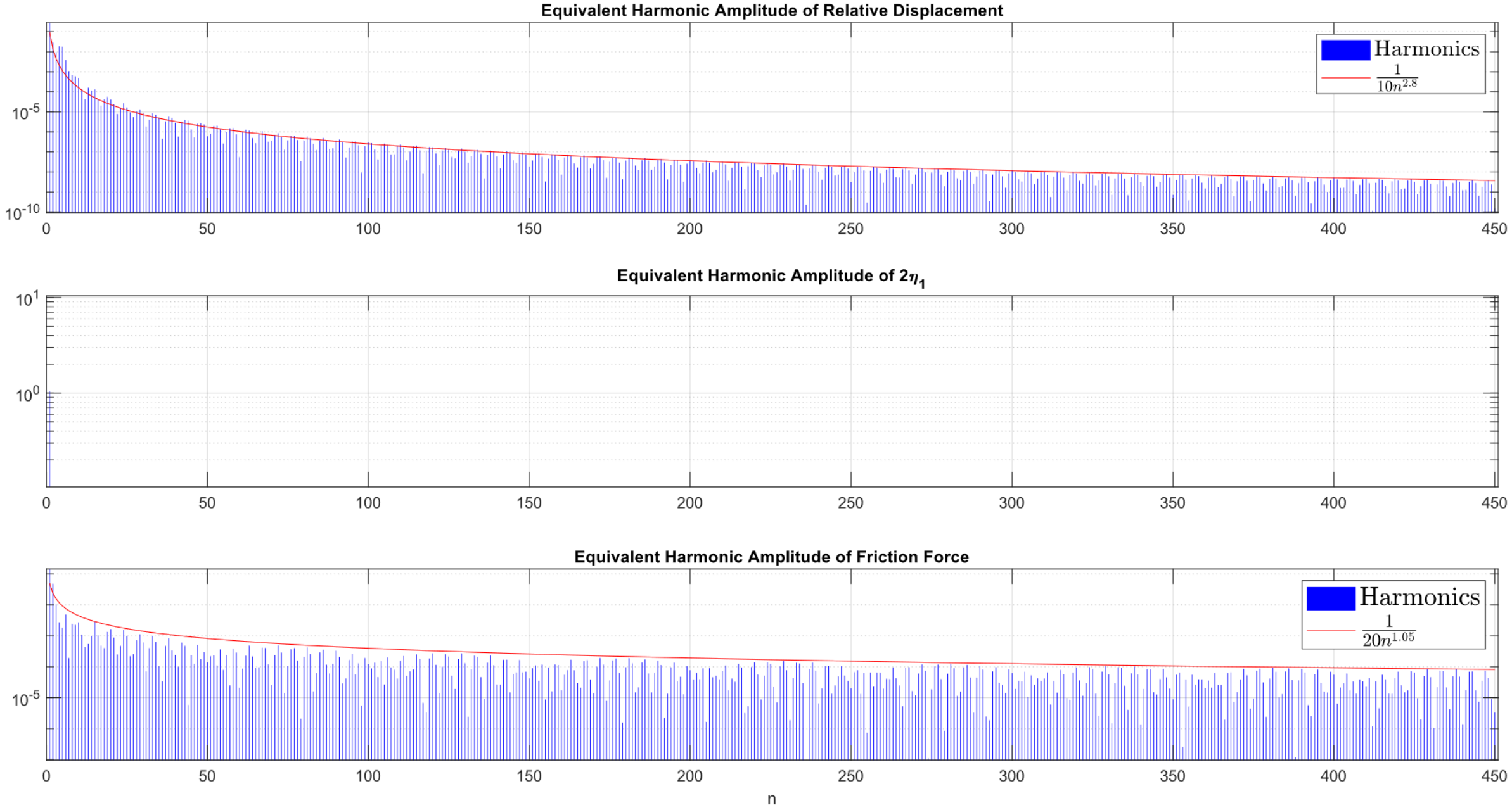
Elapsed time: 12s
First Subresonance



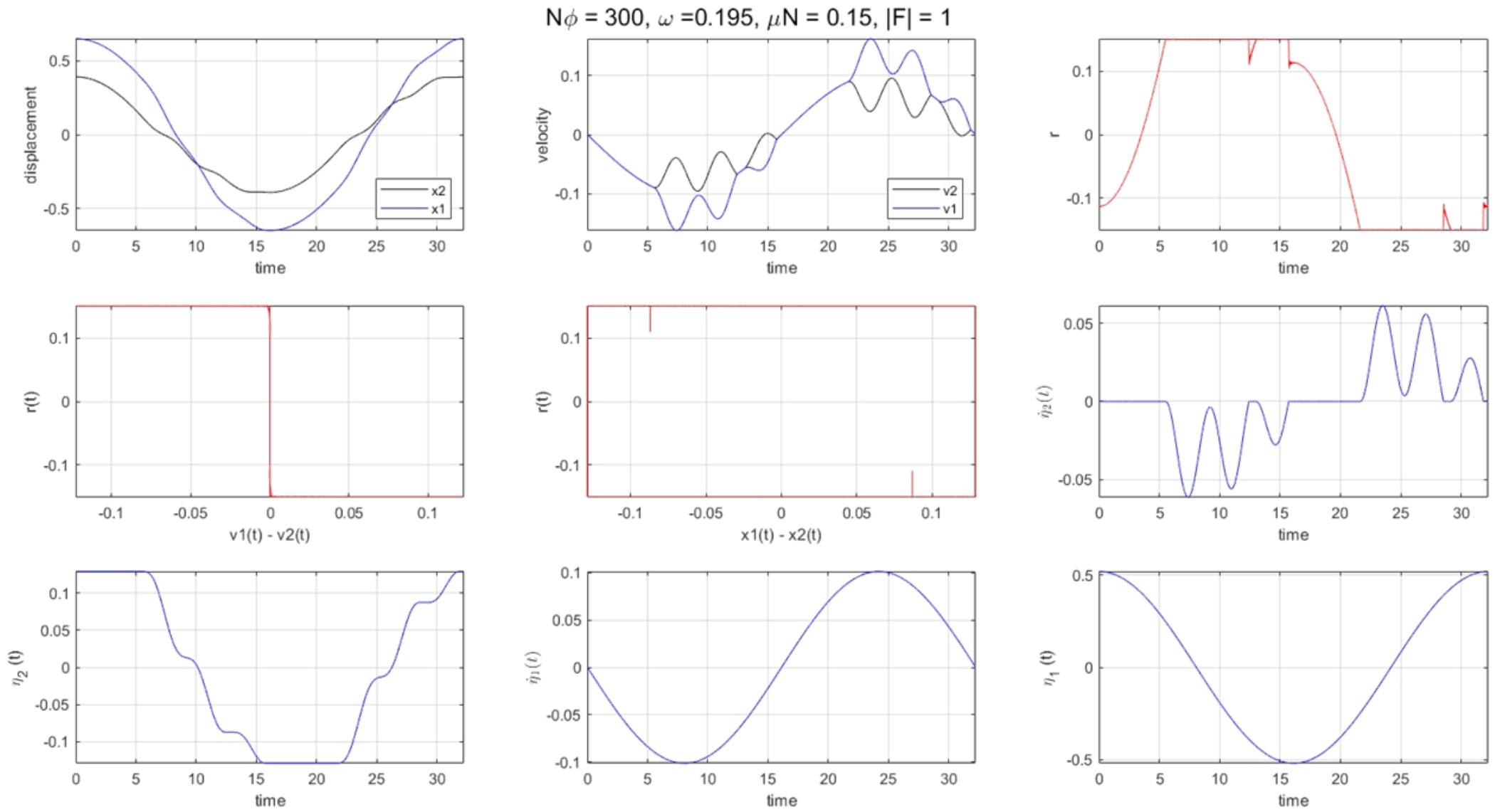

Equivalent Harmonic Amplitude of Relative Displacement
Harmonics
$\frac{1}{20n^{2.8}}$
10^{-5}
0
50
100
150
200
250
300
350
400
450
Equivalent Harmonic Amplitude of $2\eta_1$
10^{1}
10^{0}
0
50
100
150
200
250
300
350
400
450
Equivalent Harmonic Amplitude of Friction Force
Harmonics
$\frac{1}{20n^{1.05}}$
10^{-5}
0
50
100
150
200
250
300
350
400
450
n

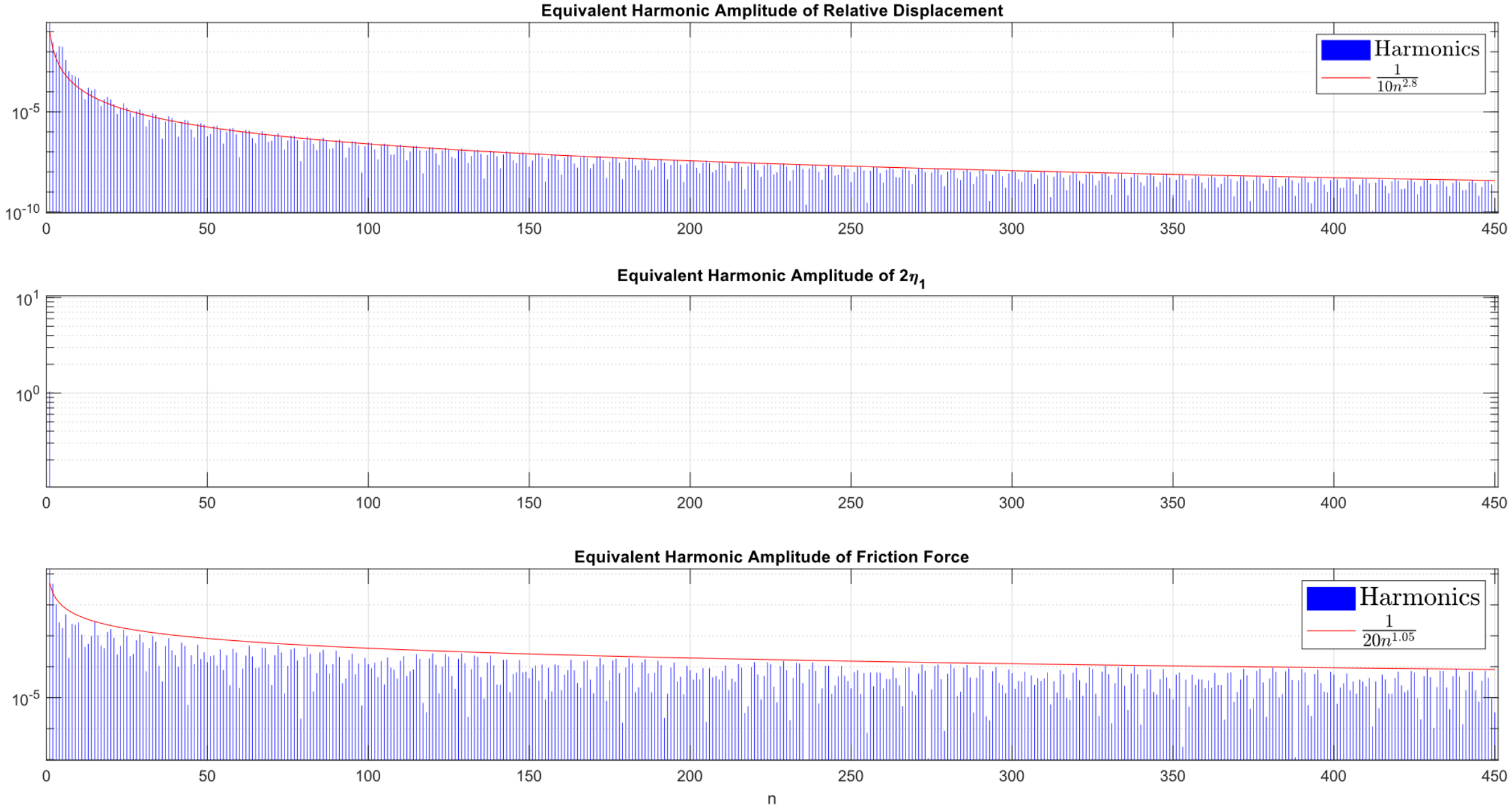
Elapsed time: 6s
Second Antiresonance



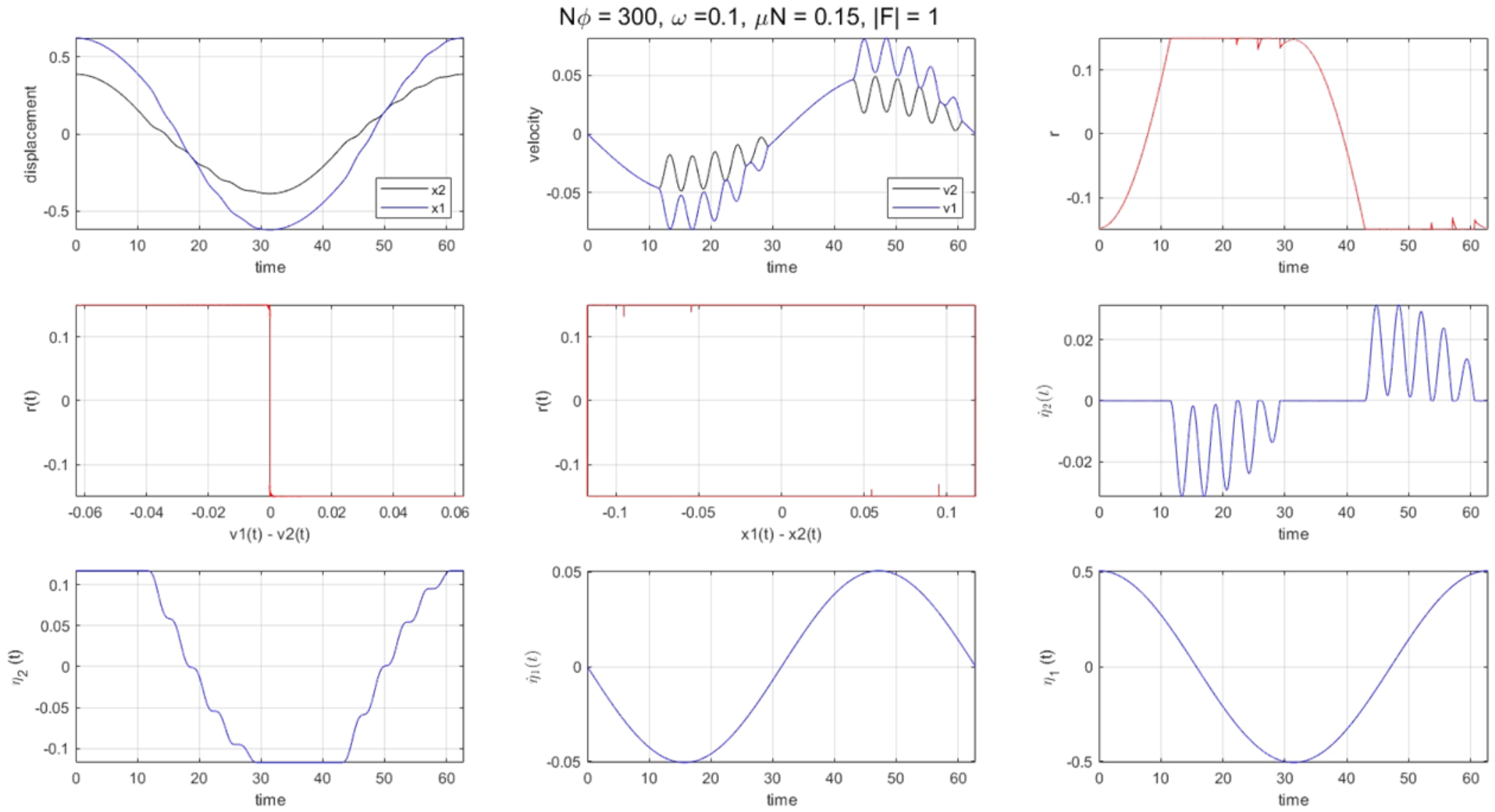

Equivalent Harmonic Amplitude of Relative Displacement
Harmonics
$\frac{1}{10n^{2.8}}$
10^{-5}
10^{-10}
0
50
100
150
200
250
300
350
400
450
Equivalent Harmonic Amplitude of $2\eta_1$
10^{1}
10^{0}
0
50
100
150
200
250
300
350
400
450
Equivalent Harmonic Amplitude of Friction Force
Harmonics
$\frac{1}{20n^{1.05}}$
10^{-5}
0
50
100
150
200
250
300
350
400
450
n

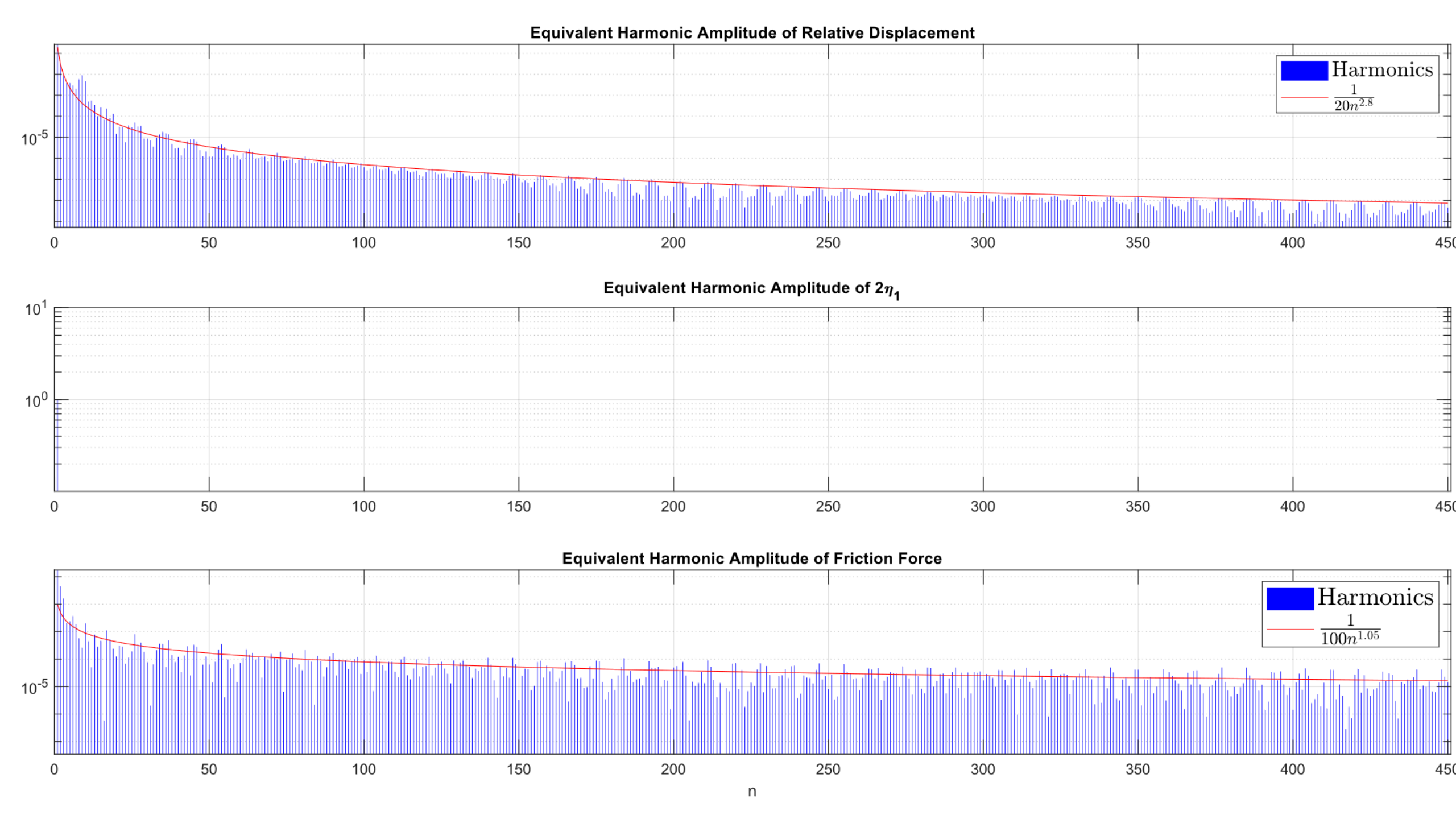
Elapsed time: 6s
Second Subresonance

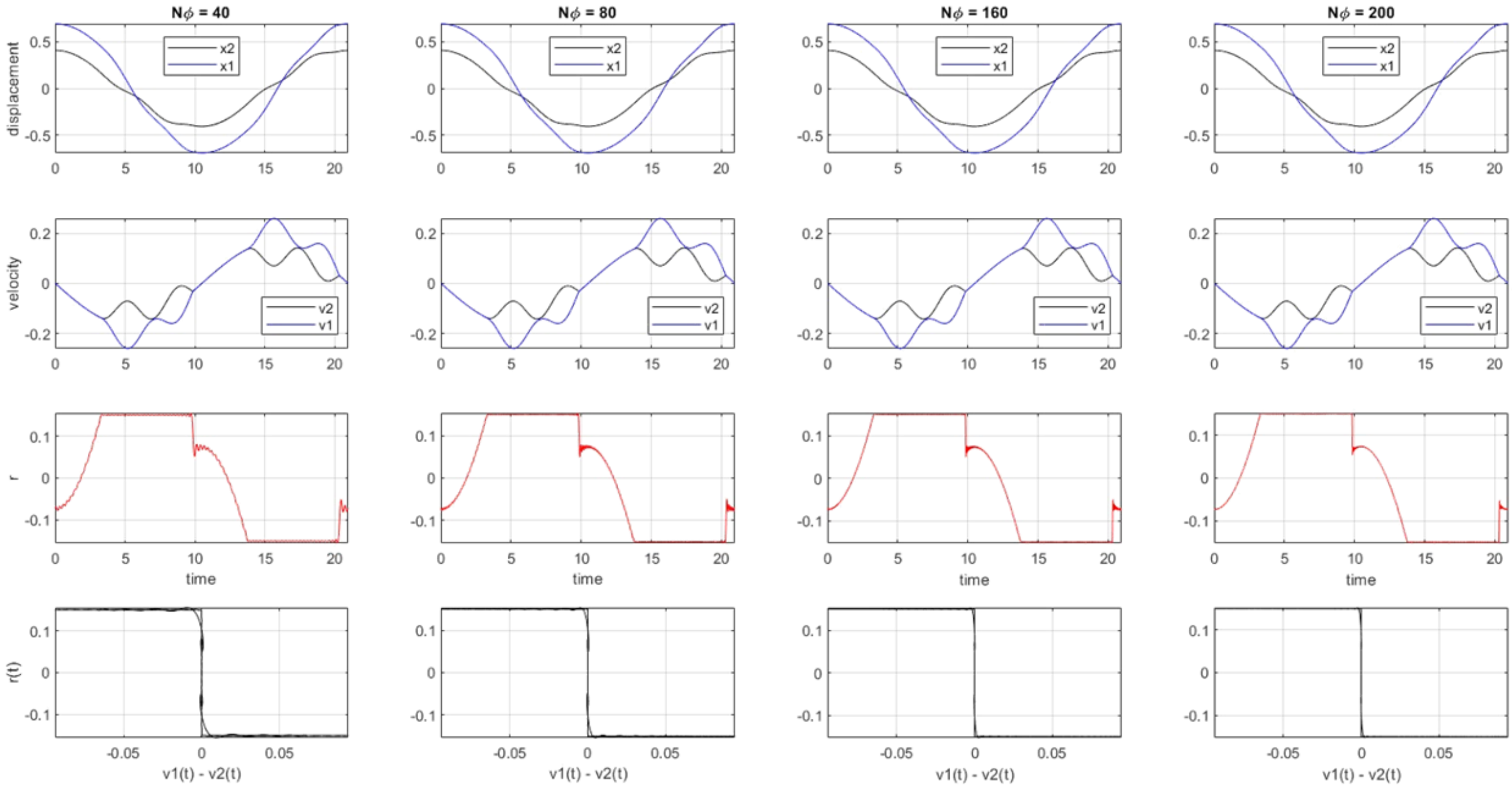



Equivalent Harmonic Amplitude of Relative Displacement
Harmonics
$\frac{1}{10n^{2.8}}$
10^{-5}
10^{-10}
0
50
100
150
200
250
300
350
400
450
Equivalent Harmonic Amplitude of $2\eta_1$
10^{1}
10^{0}
0
50
100
150
200
250
300
350
400
450
Equivalent Harmonic Amplitude of Friction Force
Harmonics
$\frac{1}{20n^{1.05}}$
10^{-5}
0
50
100
150
200
250
300
350
400
450
n

Elapsed time: 8s
Fifth Antiresonance




Equivalent Harmonic Amplitude of Relative Displacement
Harmonics
$\frac{1}{20n^{2.8}}$
10^{-5}
0
50
100
150
200
250
300
350
400
450
Equivalent Harmonic Amplitude of $2\eta_1$
10^{1}
10^{0}
0
50
100
150
200
250
300
350
400
450
Equivalent Harmonic Amplitude of Friction Force
Harmonics
$\frac{1}{100n^{1.05}}$
10^{-5}
0
50
100
150
200
250
300
350
400
450
n


Convergence Study (ω = 0.3, |F| = 1)
Nϕ = 40
Nϕ = 80
Nϕ = 160
Nϕ = 200
displacement
velocity
r
r(t)
x2
x1
v2
v1
time
v1(t) - v2(t)