

Advanced Macro

Assignment 3

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Interpolation

Julia code: [click here](#).

```
# Julia code  
# See A3.jl
```

Log utility

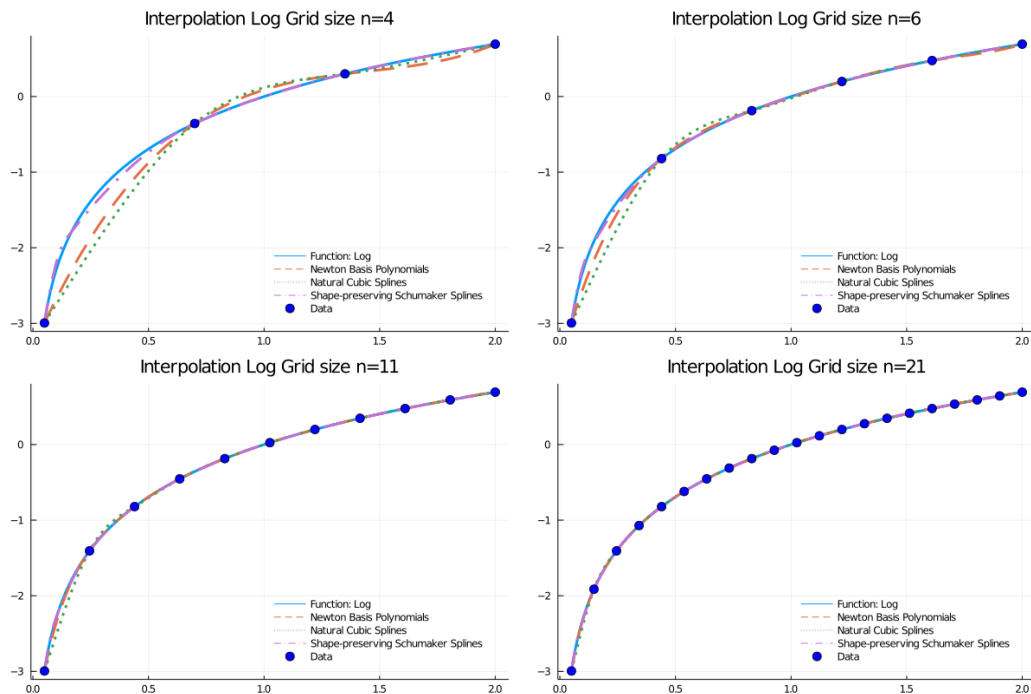


Figure 1: Interpolation Log Fn

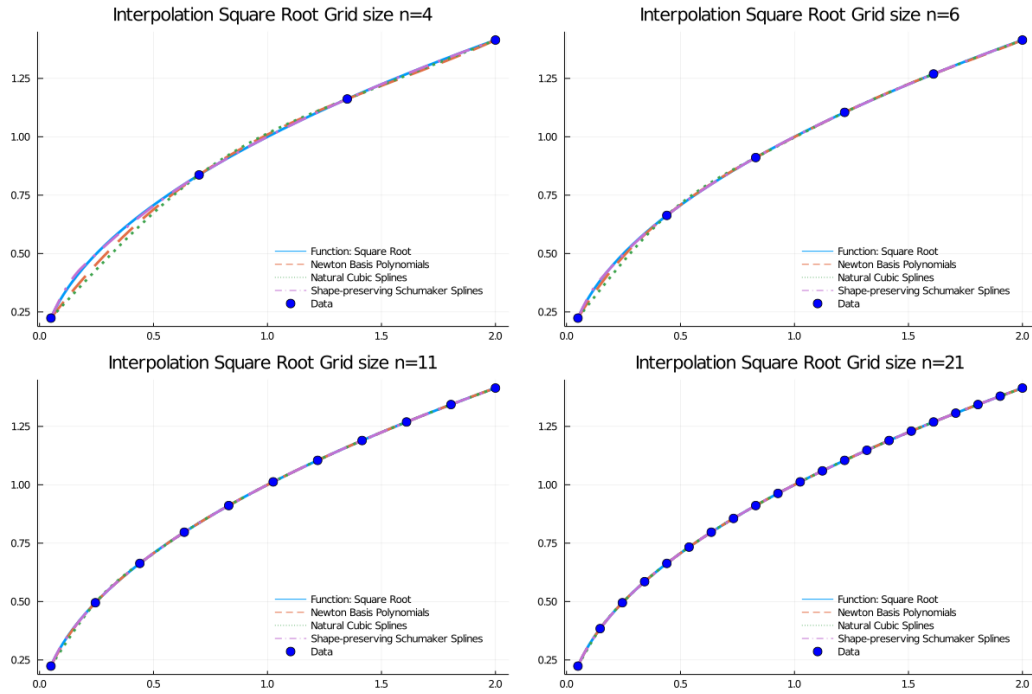


Figure 2: Interpolation Square Root Fn

Square root utility

CRRA utility

$$\sigma = 2$$

$$\sigma = 5$$

$$\sigma = 10$$

Summary of interpolation errors

I'm using the Euclidian Norm of the differences between the original function and the interpolation method. Specifically

$$||f(x) - q(x)||^2 = \left[\sum_i (f(x_i) - q(x_i))^2 \right]^{\frac{1}{2}}$$

| | Log | n=4 | n=6 | n=11 | n=21 |
|------------------------------------|-----|-------|-------|--------|---------|
| Newton Basis Polynomials | | 6.286 | 2.28 | 0.4082 | 0.03642 |
| Natural Cubic Splines | | 8.375 | 4.379 | 1.606 | 0.4928 |
| Shape-preserving Schumaker Splines | | 1.176 | 0.533 | 0.1543 | 0.03563 |

| | Square Root | n=4 | n=6 | n=11 | n=21 |
|------------------------------------|-------------|--------|---------|---------|----------|
| Newton Basis Polynomials | | 0.579 | 0.166 | 0.02202 | 0.001462 |
| Natural Cubic Splines | | 0.8726 | 0.3989 | 0.1245 | 0.03344 |
| Shape-preserving Schumaker Splines | | 0.098 | 0.03925 | 0.00975 | 0.001983 |

| CES $\sigma = 2$ | n=4 | n=6 | n=11 | n=21 |
|--------------------------|------|-------|-------|-------|
| Newton Basis Polynomials | 98.2 | 48.55 | 13.68 | 2.012 |

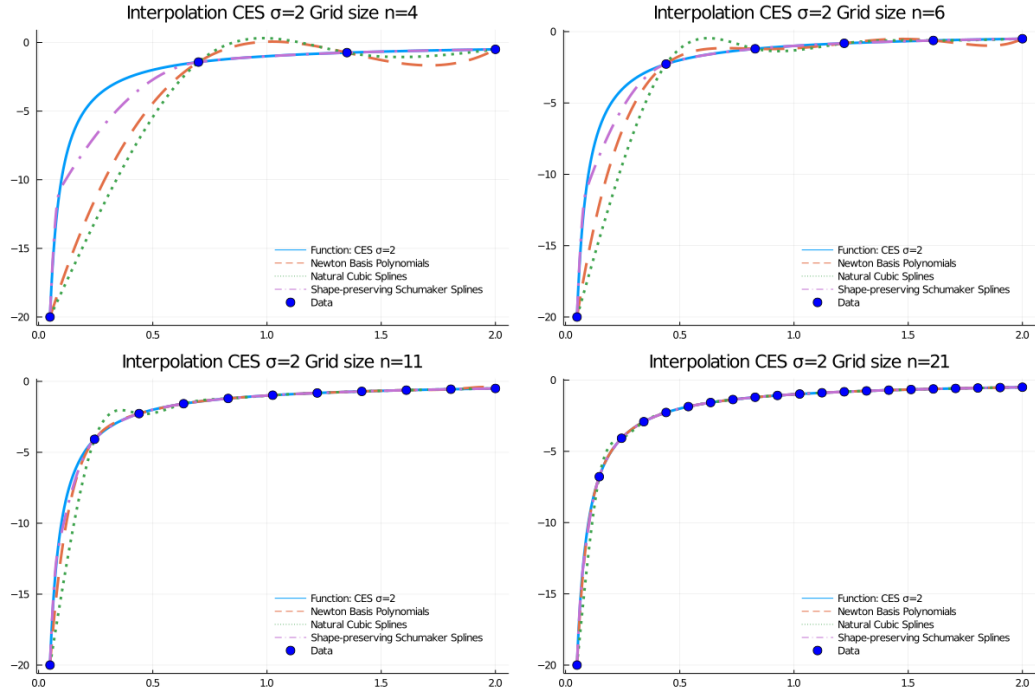


Figure 3: Interpolation CRRA $\sigma=2$ F_n

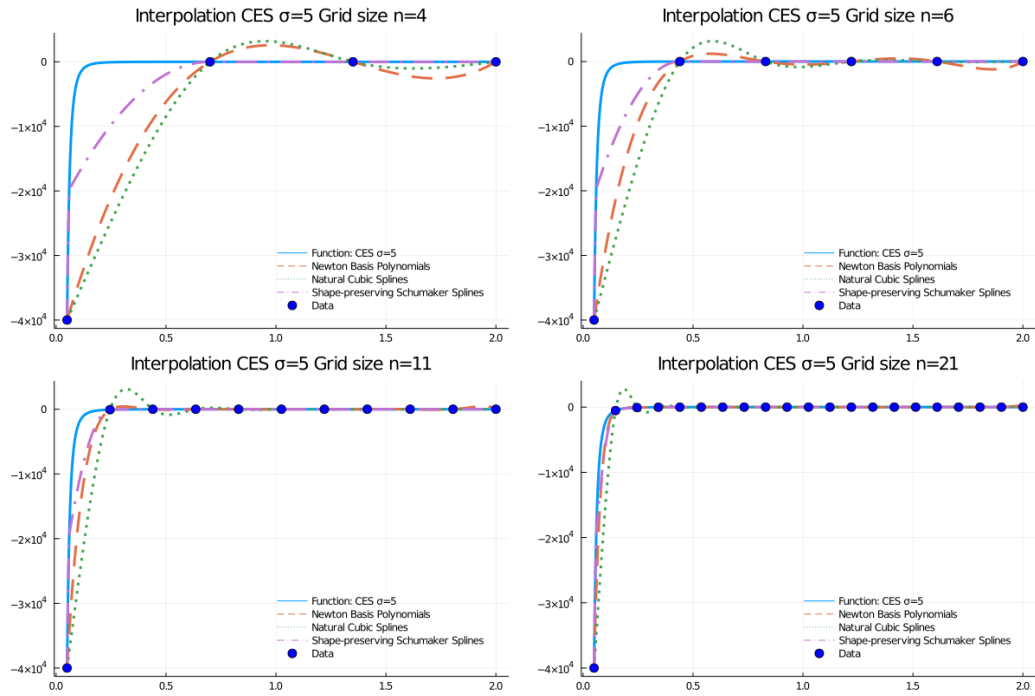


Figure 4: Interpolation CRRA $\sigma=5$ F_n

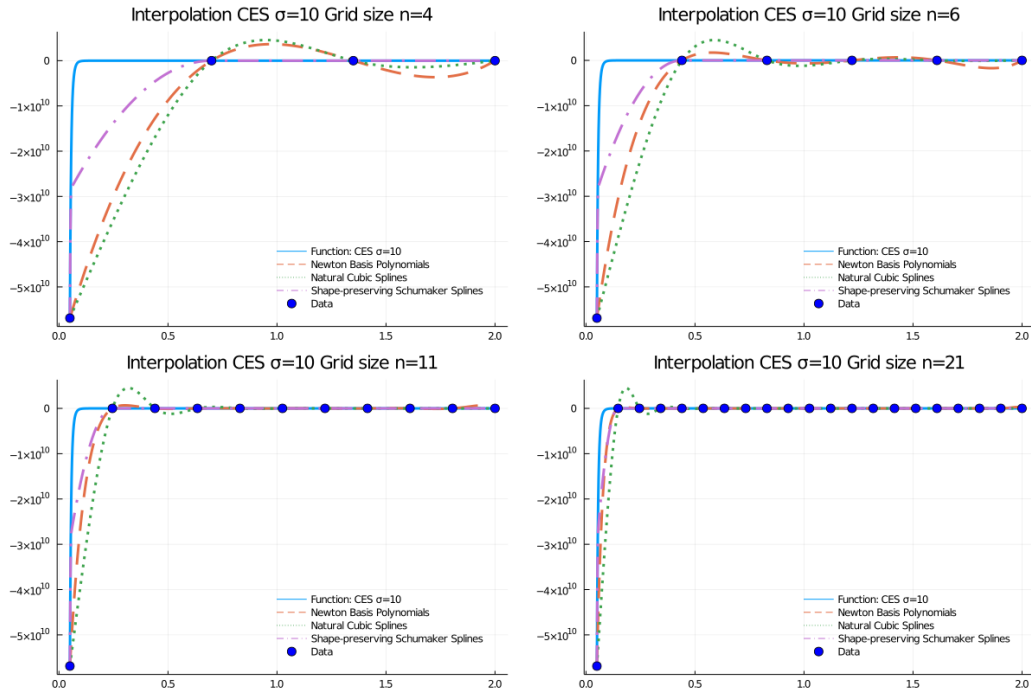


Figure 5: Interpolation CRRA sigma=10 Fn

Curvature

Interpolation error

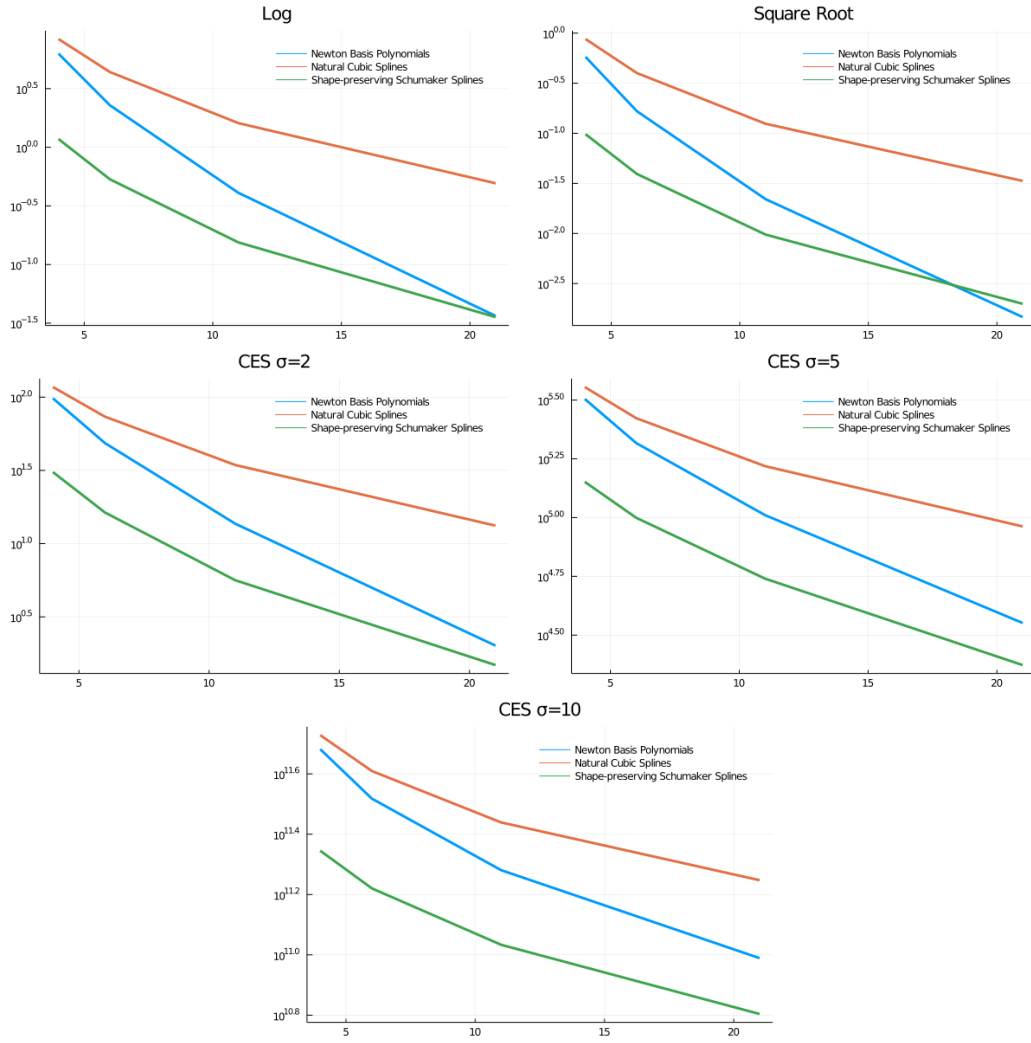


Figure 6: Interpolation error of differet interpolation methods

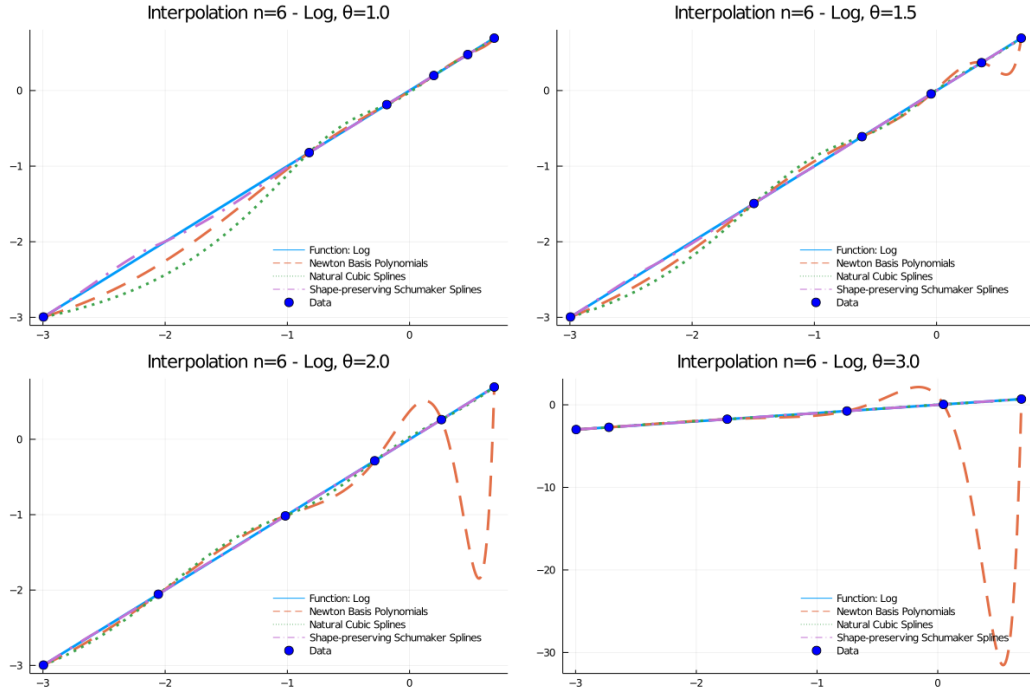


Figure 7: Interpolation, differet methods, $n=6$, log function.

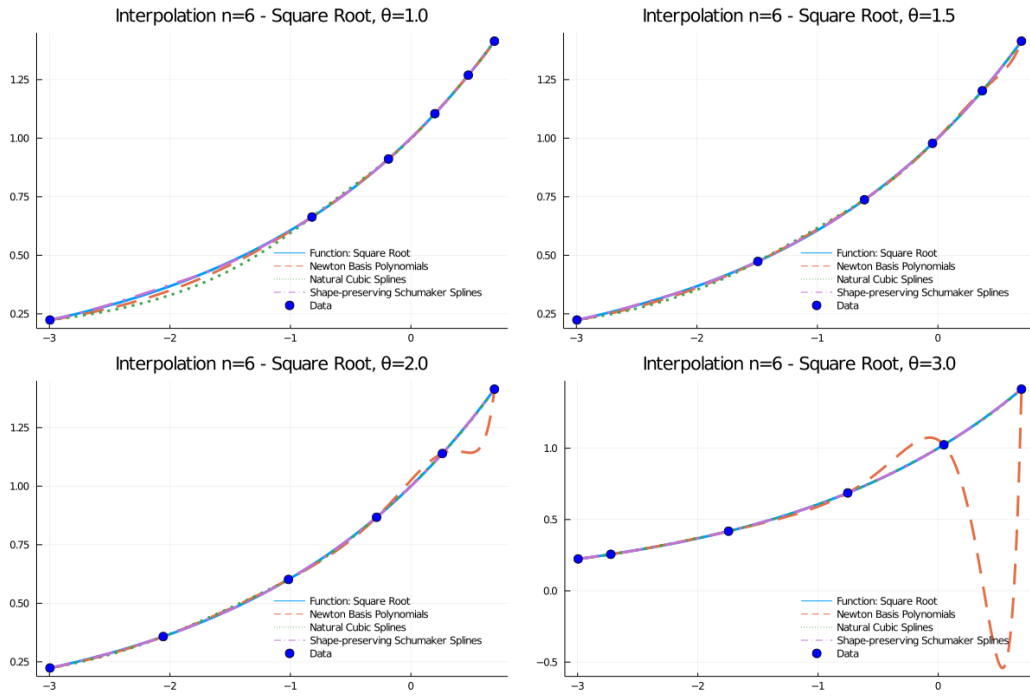


Figure 8: Interpolation, differet methods, $n=6$, square root function.

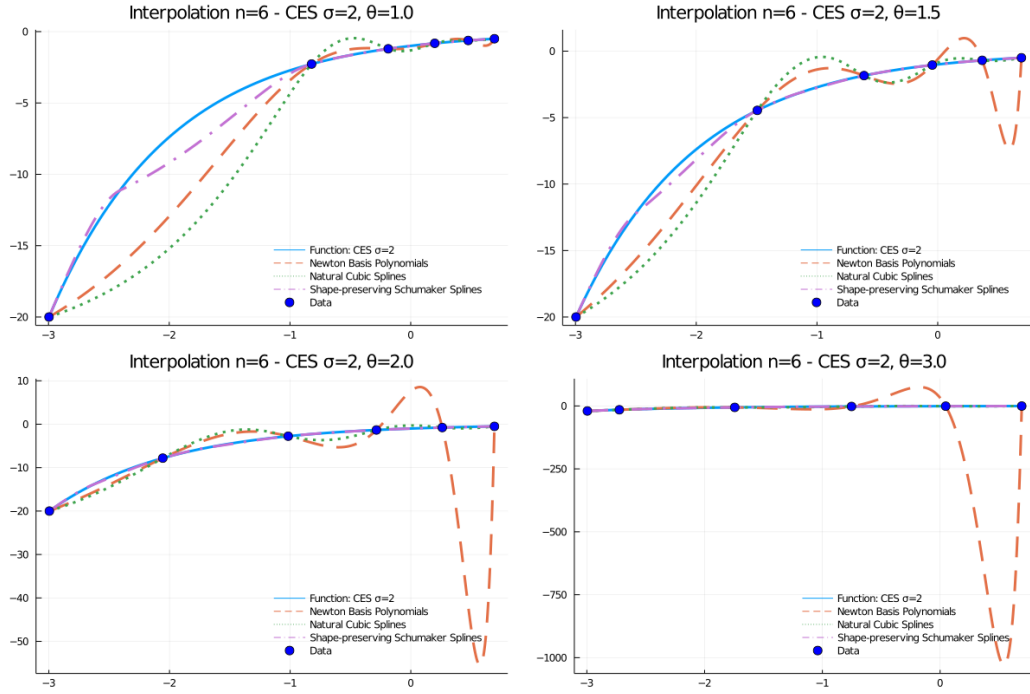


Figure 9: Interpolation, differet methods, $n=6$, CES sigma=2 function.

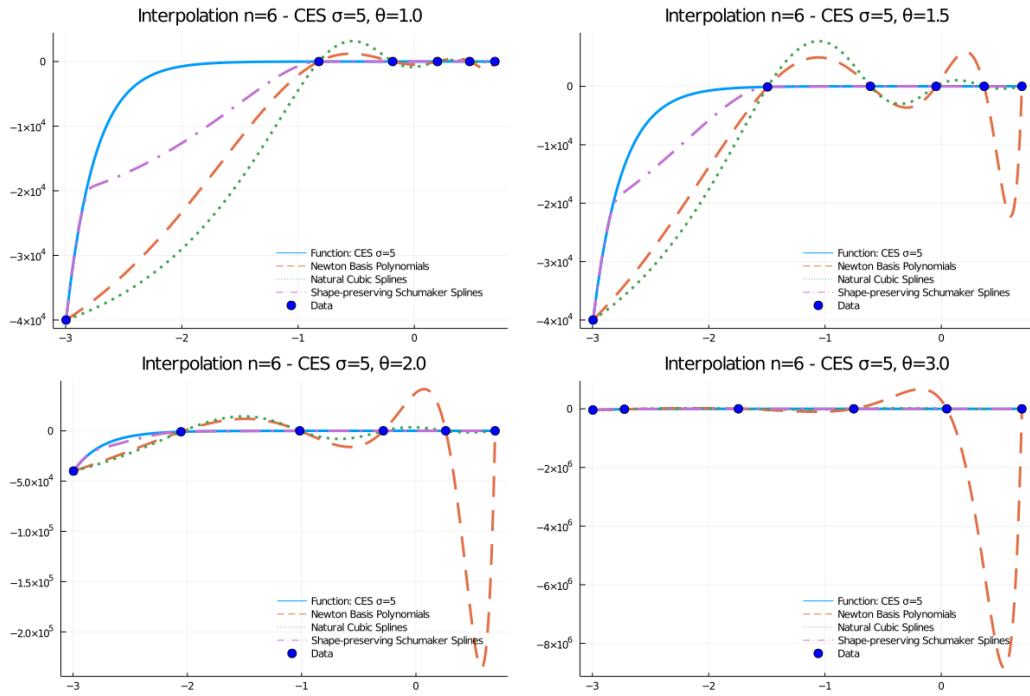


Figure 10: Interpolation, differet methods, $n=6$, CES sigma=5 function.

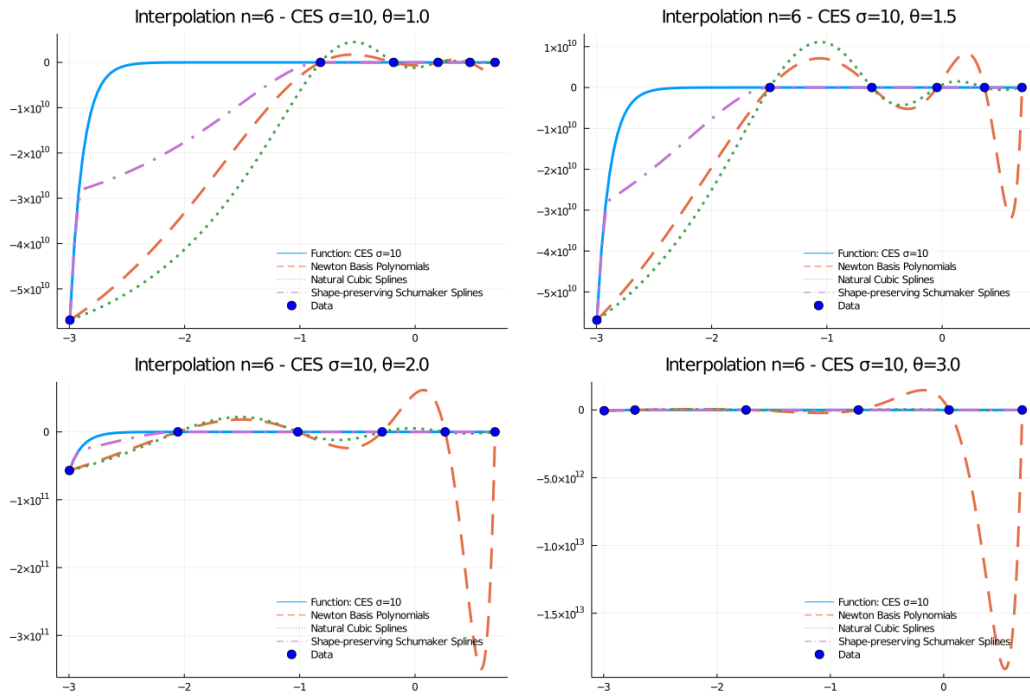


Figure 11: Interpolation, different methods, $n=6$, CES $\sigma=10$ function.

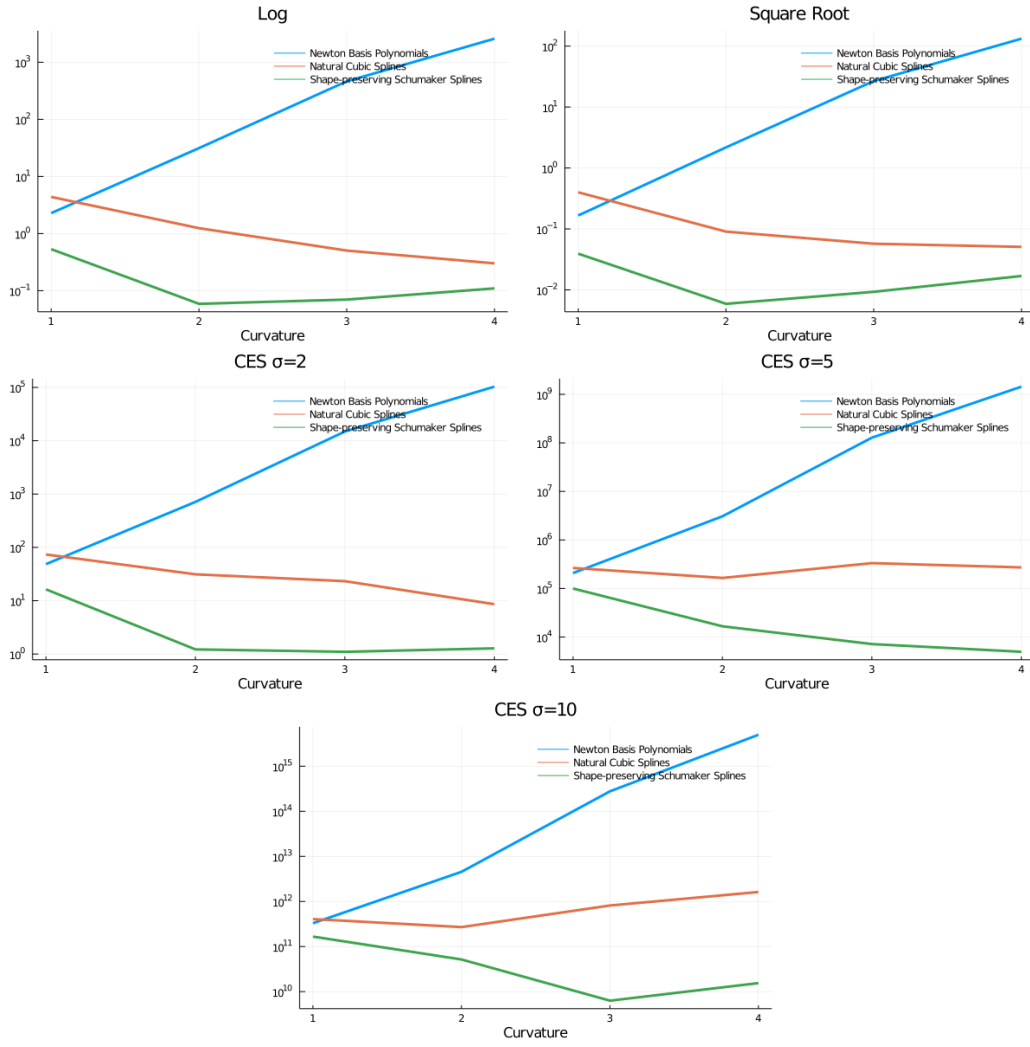


Figure 12: Interpolation error of different methods, varying the curvature of the grid.