|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Analytic Flux | | | FD Flux | | | FV Flux | | |
| Cells | Left | Right | Imbalance | Left | Right | Imbalance | Left | Right | Imbalance |
| 10 | -1.1667 | -1.1667 | 0.0000 | -1.1617 | -1.1581 | 0.0036 | -1.165 | -1.165 | -6.94E-16 |
| 20 | -1.1667 | -1.1667 | 0.0000 | -1.1658 | -1.1639 | 0.0019 | -1.1662 | -1.1662 | -9.09E-16 |
| 40 | -1.1667 | -1.1667 | 0.0000 | -1.1666 | -1.1656 | 0.001 | -1.1665 | -1.1665 | 2.22E-16 |
| 80 | -1.1667 | -1.1667 | 0.0000 | -1.1667 | -1.1661 | 5.82E-04 | -1.1666 | -1.1666 | 7.06E-14 |

In the following graphs of the errors between the analytic and numeric solutions computed via a Finite Difference method and a Finite Volume method, it is observed that the Finite Difference method results in a far smaller error at all grid resolutions. As one would expect, increasing the number of nodes in both the Finite Difference method and the Finite Volume method results in decreased errors. When flux conservation is considered however, the Finite Volume method shows itself to be vastly superior to the Finite Difference method. Even for the coarsest grid, the Finite Volume method produces a flux imbalance on the order of machine precision error while the imbalance produced by the Finite Difference method is nontrivial. As the flux imbalance in the Finite Volume method is already on the order of machine precision, it cannot be improved upon by increasing the resolution of the mesh, as the Finite Difference method flux imbalance can. In fact, using a very fine mesh actually results in a (slightly) greater flux imbalance in the Finite Volume method due to compounded error from calculations with values near machine precision error, though the flux imbalance is still negligible.