The first step is to test the program with an analytical solution. The apparent horizon equation is analytically solvable using the Schwarzschild metric under spherical symmetry. The resulting apparent horizon equation is:

$$\kappa = \frac{1 - 2M/r}{r\sqrt{1 + 2M/r}}. \tag{0.1}$$

In the test that follows, I have taken the mass of the black hole to be $M = 1.0$; and situated it at the origin of the computational domain. The apparent horizon is expected at $r = 2.0$ and it is indeed located there as seen in a later plot.