Laminar Flow in a Pipe that is Started from Rest

Unsteady laminar pipe flow is obtained by starting the flow from rest and imposing a constant pressure gradient thereafter. The effect of the no-slip condition on the axial velocity diffuses inward from the pipe walls and reaches the center of the pipe with a timescale of *T = /v*. In the long-time limit, the solution for steady flow in the pipe is obtained. We assume that *R* = 5,0 mm, and v = 0,00038/s, ρ = 1000 kg/, and *dP/dZ* = 1,0 x Pa/m. We use pdepe with m = 1, which signifies a cylindrical coordinate system. We shall determine the solution for 0 ≤ t ≤ 0,07 s.