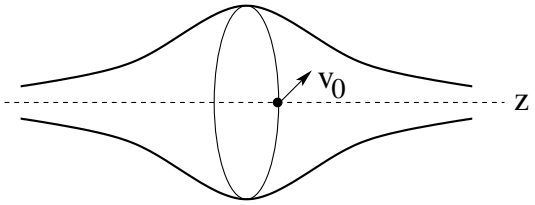
[mex119] Dynamical trap without potential energy

Consider a surface of revolution with cylindrical coordinates $z, \phi, r(z) = (1+z^2)^{-1}$. A particle of mass m is constrained to move on that surface without friction. It is launched at $z = 0$ with a speed v_0 in a direction at 45° relative to the meridian. Find the maximum value of $|z|$ the particle reaches along its trajectory.



Solution: