1. (10 pts) Calculate the speed at which a spherical raindrop hits the ground in a windless rainstorm if its diameter is 0.6 mm. The drag coefficient of a sphere is 0.47.

\[ F_d = -\frac{1}{2} \rho C_d A v^2 \]

\[ F_d = -\frac{1}{2} (1.2)(0.47)(0.00377)v^2 + 3 \]

\[ m \cdot F_d = 0.001 \cdot 6.314 \cdot v^2 \]

\[ F_{drop} = 0.00726 \times 9.81 = 0.0722022 \text{ N} \]

\[ F_{drop} = 0.00106314v^2 \]

\[ v = 4.568 \text{ m/s} \]

\[ \text{Diameter} = 0.6 \text{ mm} \]

\[ \rho = 1000 \text{ kg/m}^3 \]

\[ \frac{A}{m} = \frac{\pi (0.00377)^2}{0.001} = 0.008277 \]

\[ \frac{1}{\sqrt{\pi}} \approx 1.0 \times 10^{-3} \text{ kg/m} \]

\[ C_d = 0.47 \]

\[ V_{D} = m \times C_d \]

\[ m = (1.0 \times 10^{-3}) \times (2.262 \times 10^{-6}) \]

\[ = 0.00226 \text{ kg} \]