5.4. A Cessna 172 is cruising at 10,000 ft on a standard day \((\rho_{\infty} = 0.001756 \text{ slug/ft}^3)\) at 130 mi/h.

If the airplane weighs 2300 lb, what \(C_L\) is required to maintain level flight?

\[
V_{\infty} = 130 \text{ mph} = 190.7 \text{ ft/s}
\]

\[
C_L = \frac{L}{\frac{1}{2} \rho V^2 s}
\]

for steady level flight \(L = w\)

\[
C_L = \frac{w}{\frac{1}{2} \rho V^2 s}
\]

We need \(s\), but we know

\[
AR = 7.32
\]

\[
b = 35.83 \text{ ft}
\]

\[
AR = \frac{b^2}{s} \quad s = \frac{b^2}{AR} = \frac{(35.83)^2}{7.32} = 175.4 \text{ ft}^2
\]

\[
C_L = \frac{2300}{\frac{1}{2} (0.001756)(190.7)^2(175.4)} = 0.4107
\]

\[
C_L = 0.4107
\]