F8. A wing is to have an elliptic circulation distribution.

\[ \Gamma(y) = \Gamma_0 \sqrt{1 - \left(\frac{2y}{b}\right)^2} \]

The planform is to be a straight taper, with root and tip chords defined in terms of the average chord \( c_{\text{avg}} \) and the taper ratio \( r = c_t/c_r \).

\[ c_r = c_{\text{avg}} \frac{2}{1 + r} \quad c_t = c_{\text{avg}} \frac{2r}{1 + r} \]

a) Define the chord distribution \( c(y) \) in terms of \( c_{\text{avg}} \) and \( r \). Assuming \( c_{\text{avg}}/b = 0.125 \), draw the planforms for \( r = 0.75, 0.5, 0.25 \).

b) Determine the spanwise \( c_t(y) \) distribution, and plot for \( r = 0.75, 0.5, 0.25 \).

Note: Only the shape of the \( c_t(y) \) curve is of interest. All scaling constants like \( \Gamma_0, c_{\text{avg}}, \) etc. can be set to unity for plotting purposes.

c) Local stall is obviously undesirable. If the airfoil is the same across the span, which taper ratio appears to be most attractive for the purpose of giving the largest stall margin everywhere on the wing?