2.5 Compute the unit-pulse response $h[n]$ for $n = 0, 1, 2, 3$ for each of the following discrete-time systems:

(c) $y[n + 2] + 1.5y[n + 1] + 0.5y[n] = x[n]$

➢ Solve manually. Also, sketch $h[n]$ w/ stems labeled. [Hint: Exploit time-invariance to re-index I/O difference equation.]

Re-index by letting $n \to n-2$ (Time-Invariant property)

$$y[n] + 1.5\, y[n-1] + 0.5\, y[n-2] = x[n-2]$$

Put in recursive form w/ $x[\cdot] = \delta[\cdot]$ & $y[\cdot] = h[\cdot]$

$$h[n] = -1.5\,h[n-1] - 0.5\,h[n-2] + \delta[n-2]$$

$n=0$ $\quad h[0] = -1.5\,h[-1] - 0.5\,h[-2] + \delta[-2] = \underline{\underline{0}}$
$\qquad\qquad\qquad\quad \to 0$

$n=1$ $\quad h[1] = -1.5\,h[0] - 0.5\,h[-1] + \delta[-1] = \underline{\underline{0}}$
$\qquad\qquad\qquad \to 0 \qquad\quad \to 0 \qquad \to 0$

$n=2$ $\quad h[2] = -1.5\,h[1] - 0.5\,h[0] + \delta[0] = \underline{\underline{1}}$
$\qquad\qquad\qquad \to 0 \qquad\quad \to 0$

$n=3$ $\quad h[3] = -1.5\,h[2] - 0.5\,h[1] + \delta[1] = \underline{\underline{-1.5}}$
$\qquad\qquad\qquad\quad \to 1 \qquad\quad \to 0 \qquad \to 0$