3.30) $A_1 = \begin{bmatrix} 1 & 2 \\ 2 & 1 \\ 1 & 3 \end{bmatrix}$ $\quad v_1 \quad v_2$

Busco base ortonormal de col A, $B' = \{w_1, w_2\}$

- $w_1 = \dfrac{v_1}{\|v_1\|} = \dfrac{[1\ 2\ 1]^T}{\sqrt{6}} = \underbrace{\left[\dfrac{1}{\sqrt{6}} \quad \dfrac{2}{\sqrt{6}} \quad \dfrac{1}{\sqrt{6}}\right]^T}_{w_1}$

- $v_2 = v_2 - \langle v_2, w_1 \rangle w_1 \rightarrow v_2 = [2\ 1\ 3]^T - \dfrac{7}{\sqrt{6}} \cdot \left[\dfrac{1}{\sqrt{6}} \quad \dfrac{2}{\sqrt{6}} \quad \dfrac{1}{\sqrt{6}}\right]^T =$

$= [2\ 1\ 3]^T - \left[\dfrac{7}{6} \quad \dfrac{7}{3} \quad \dfrac{7}{6}\right]^T = \left[\dfrac{5}{6} \quad -\dfrac{4}{3} \quad \dfrac{11}{6}\right]^T \times 6 = [5\ -8\ 11]$

- $w_2 = \dfrac{v_2}{\|v_2\|}$ [illegible] $= \dfrac{[5\ -8\ 11]^T}{\sqrt{210}} = \underbrace{\left[\dfrac{5}{\sqrt{210}} \quad \dfrac{-8}{\sqrt{210}} \quad \dfrac{11}{\sqrt{210}}\right]^T}_{w_2}$

Por lo tanto:

$$Q = \begin{bmatrix} \frac{1}{\sqrt{6}} & \frac{5}{\sqrt{210}} \\ \frac{2}{\sqrt{6}} & \frac{-8}{\sqrt{210}} \\ \frac{1}{\sqrt{6}} & \frac{11}{\sqrt{210}} \end{bmatrix}$$

$A_1 = QR$, $R = Q^T A_1 = \begin{bmatrix} \frac{1}{\sqrt{6}} & \frac{2}{\sqrt{6}} & \frac{1}{\sqrt{6}} \\ \frac{5}{\sqrt{210}} & \frac{-8}{\sqrt{210}} & \frac{11}{\sqrt{210}} \end{bmatrix} \cdot \begin{bmatrix} 1 & 2 \\ 2 & 1 \\ 1 & 3 \end{bmatrix} =$

$$= \begin{bmatrix} \frac{6}{\sqrt{6}} & \frac{7}{\sqrt{6}} \\ 0 & \frac{35}{\sqrt{210}} \end{bmatrix} = R.$$

$\rightarrow$ $A_1 = \begin{bmatrix} \frac{1}{\sqrt{6}} & \frac{5}{\sqrt{210}} \\ \frac{2}{\sqrt{6}} & \frac{-8}{\sqrt{210}} \\ \frac{1}{\sqrt{6}} & \frac{11}{\sqrt{210}} \end{bmatrix} \cdot \begin{bmatrix} \frac{6}{\sqrt{6}} & \frac{7}{\sqrt{6}} \\ 0 & \frac{35}{\sqrt{210}} \end{bmatrix}$

Q R

IDEM PROCED. P/ A2 y A3.