2)

$$A = \begin{pmatrix} 1 & 2 & 1 \\ 1 & 0 & -1 \end{pmatrix} \qquad A^T = \begin{pmatrix} 1 & 1 \\ 2 & 0 \\ 1 & -1 \end{pmatrix}$$

$$A^T A = \begin{pmatrix} 2 & 2 & 0 \\ 2 & 4 & 2 \\ 0 & 2 & 2 \end{pmatrix} \qquad AA^T = \begin{pmatrix} 6 & 0 \\ 0 & 2 \end{pmatrix}$$

$$\begin{vmatrix} 6-\lambda & 0 \\ 0 & 2-\lambda \end{vmatrix} = (6-\lambda)(2-\lambda) = \lambda^2 - 8\lambda + 12$$

$$\lambda_{1,2} = \frac{8 \pm \sqrt{(-8)^2 - 4 \cdot 12}}{2 \cdot 1} = 4 \pm 2$$

$$\lambda_1 = 6 \qquad \lambda_2 = 2$$

$$\sigma_1 = \sqrt{6} \qquad \sigma_2 = \sqrt{2}$$