Section 1.

1. In R^2, $\because V_3 \cdot V_1 = 0$ and $V_3 \cdot V_2 = 0$. $\therefore V_1$ and V_3 are orthogonal. also for V_3 and V_2.

$\therefore V_1 = \lambda V_2$, $\lambda \in R$, which is a contradiction with "$\{V_1, V_2\}$ is linearly independent."

2. $$p_A(\lambda) = \det(A - \lambda I) = \det\left(\begin{bmatrix} a & b \\ c & d \end{bmatrix} - \begin{bmatrix} \lambda & 0 \\ 0 & \lambda \end{bmatrix}\right)$$

$$= \begin{vmatrix} a-\lambda & b \\ c & d-\lambda \end{vmatrix}$$

$$= (a-\lambda)(d-\lambda) - bc.$$

$$= \lambda^2 - (a+d)\lambda + (ad-bc)$$

For unique λ, $(a+d)^2 - 4(ad-bc) = 0$

$$a^2 + 2ad + d^2 - 4ad + 4bc = 0$$

$$(a-d)^2 = -4ac.$$

If a, b, c, d are all positive, then $-4ac < 0$.

However $(a-d)^2 \geq 0$, which is a contradiction.

$\therefore$ Not exists such A.