

$$\begin{aligned} \langle -4, b, 3 \rangle \text{ and } \langle b, b^2, b \rangle \text{ are orthogonal when } \langle -4, b, 3 \rangle \cdot \langle b, b^2, b \rangle = 0 &\Leftrightarrow \\ (-4)(b) + (b)(b^2) + (3)(b) = 0 &\Leftrightarrow b(b+1)(b-1) = 0 \Leftrightarrow b = 0 \text{ or } \\ b = \pm 1. \end{aligned}$$