$$< u, v > = 0$$

$$\Rightarrow < au, bv > = 0 \; \forall a, b \in \mathbb{R}$$

$$Proof \; :$$

$$< au, bv > = ab < u, v >$$

$$= ab(0) = 0$$

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$$v_1 = u_1 = (1,1,1)$$

$$v_2 = u_2 - \frac{< u_2, v_1 >}{\|v_1\|^2} v_1 = \left(-\frac{2}{3}, \frac{1}{3}, \frac{1}{3}\right)$$

$$v'_2 = 3v_2 = (-2,1,1)$$

$$v_3 = u_3 - \frac{< u_3, v_1 >}{\|v_1\|^2} v_1 - \frac{< u_3, v'_2 >}{\|v'_2\|^2} v'_2$$

$$= (0,0,1) - \frac{1}{3}(1,1,1) - \frac{1}{6}(-2,1,1)$$

$$= \left(-\frac{1}{3}, -\frac{1}{3}, \frac{2}{3}\right) + \left(\frac{2}{6}, -\frac{1}{6}, -\frac{1}{6}\right)$$

$$= \left(0, -\frac{1}{2}, \frac{1}{2}\right)$$

$$v'_3 = 2v_3 = (0,-1,1)$$

$$q_1 = \frac{1}{\|v_1\|} v_1 = \frac{1}{\sqrt{3}}(1,1,1)$$

$$q_2 = \frac{1}{\|v'_2\|} v'_2 = \frac{1}{\sqrt{6}}(-2,1,1)$$

$$q_3 = \frac{1}{\|v'_3\|} v'_3 = \frac{1}{\sqrt{2}}(0,-1,1)$$