Find two unit vectors orthogonal to both given vectors.

$$\langle 1, -1, 1 \rangle, \quad \langle 0, 2, 2 \rangle.$$ 

**SOLUTION:** The cross product of the given vectors (call them $a$ and $b$) is orthogonal to both:

$$a \times b = \begin{vmatrix} i & j & k \\ 1 & -1 & 1 \\ 0 & 2 & 2 \end{vmatrix} = \begin{vmatrix} -1 & 1 \end{vmatrix}i - \begin{vmatrix} 1 & 1 \end{vmatrix}j + \begin{vmatrix} 1 & -1 \end{vmatrix}k$$

$$= -4i - 2j + 2k.$$ 

The length of $c = a \times b$ is $\sqrt{(-4)^2 + (-2)^2 + 2^2} = \sqrt{24} = 2\sqrt{6}$. Therefore, the two unit vectors orthogonal to both $a$ and $b$ are

$$\pm \frac{c}{|c|} = \pm \frac{1}{\sqrt{6}} \langle -2, -1, 1 \rangle.$$