Physics 480/581

1. Answer parts (a), (b), and (c) of Problem 31.1 from Thomas Moore's text, which involves a sinusoidal wave with wave vector null and moving in the $+\hat{z}$-direction, and polarization matrix of he form

$$
\begin{array}{c c}
 & \begin{matrix} t & x & y & z \end{matrix} \\
\begin{matrix} t \\ x \\ y \\ z \end{matrix} &
\begin{pmatrix}
a & 0 & 0 & a \\
0 & b & 0 & 0 \\
0 & 0 & c & 0 \\
a & 0 & 0 & a
\end{pmatrix}
\end{array}.
$$

2. On p. 398 of Moore's text, a binary star system is approximated by a pair of point masses m_1 and m_2 rotating, with frequency ω, about their center of mass, from which they are distances r_1 and r_2, the sum of these two being the constant D. Verify the matrix shown for their reduced quadrupole moment tensor, in Equation (34.5). Then go on and understand (34.7).

3. If $\widetilde{K}$ is a Killing vector and $\widetilde{u}$ is a geodesic, show that their scalar product is a constant along that geodesic. Recall that Killing's equations say that

$$
K_{(\beta;\alpha)} = 0 \ .
$$