Goldstein
6.4. cont

$$\therefore \boxed{n^{+} = \left\{(2l^2)\left[(m_1+m_2)+\sqrt{(m_1+m_2)m_2}\right]\right\}^{-\frac{1}{2}} \begin{pmatrix} 1 \\ \sqrt{\frac{m_1+m_2}{m_2}} \end{pmatrix}}$$

$\Leftarrow$ properly normalized

For n^{-},

$$(n^{-}, M n^{-}) = \left(1, -\sqrt{\frac{m_1+m_2}{m_2}}\right) \begin{pmatrix} (m_1+m_2)l^2 & m_2 l^2 \\ m_2 l^2 & m_2 l^2 \end{pmatrix} \begin{pmatrix} 1 \\ -\sqrt{\frac{m_1+m_2}{m_2}} \end{pmatrix}$$

$$= \left(1, -\sqrt{\frac{m_1+m_2}{m_2}}\right) \begin{pmatrix} (m_1+m_2)l^2 - m_2 l^2 \sqrt{\frac{m_1+m_2}{m_2}} \\ m_2 l^2 - m_2 l^2 \sqrt{\frac{m_1+m_2}{m_2}} \end{pmatrix} = l^2 \left\{ (m_1+m_2) - \sqrt{(m_1+m_2)m_2} - \sqrt{(m_1+m_2)m_2} + (m_1+m_2) \right\}$$

$$\therefore \boxed{n^{-} = \left\{(2l^2)\left[(m_1+m_2)-\sqrt{m_2(m_1+m_2)}\right]\right\}^{-\frac{1}{2}} \begin{pmatrix} 1 \\ -\sqrt{\frac{m_1+m_2}{m_2}} \end{pmatrix}}$$

$\Leftarrow$ properly normalized.