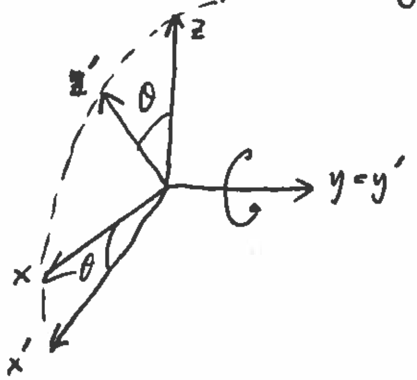
$\boxed{24.1}$ In the eq. (24.35)

$$\psi'^{\lambda}(\vec{x}) = \sum_{\sigma} D^{(\frac{1}{2})}(R)^{\lambda}_{\sigma}\, \psi^{\sigma}(R^{-1}\vec{x})$$

the rotation R is defined by $\vec{x}' = R\vec{x}$ (active viewpoint, rotating vectors). In this problem the frame is ~~rotation~~ rotated in the positive sense about the y-axis by an angle θ :



$\therefore$ the R used in the above formula is one where vectors are rotated about the y-axis by an angle $-\theta$: that is
$R(0,-\theta,0)$

Now $$D^{(\frac{1}{2})}(R) = D^{(\frac{1}{2})}(0,-\theta,0) = d^{1/2}(-\theta) = \begin{pmatrix} \cos\frac{\theta}{2} & \sin\frac{\theta}{2} \\ -\sin\frac{\theta}{2} & \cos\frac{\theta}{2} \end{pmatrix}$$ (See Eq. (22.13))

$$\therefore \begin{pmatrix} \psi'^{\uparrow}(\vec{x}) \\ \psi'^{\downarrow}(\vec{x}) \end{pmatrix} = \frac{1}{(2\pi)^{3/2}} e^{iky} \begin{pmatrix} \cos\frac{\theta}{2} & \sin\frac{\theta}{2} \\ -\sin\frac{\theta}{2} & \cos\frac{\theta}{2} \end{pmatrix} \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

$$= \boxed{\frac{1}{(2\pi)^{3/2}} e^{iky} \begin{pmatrix} \cos\frac{\theta}{2} \\ -\sin\frac{\theta}{2} \end{pmatrix}}$$