HW #5
Intermediate Quantum 491

Townsend problems from Chapter 2: 2.13, 2.15, 2.16, 2.18, 2.20, 2.22

#7 For the direction $\hat{n} = \sin\theta\,(\cos\phi\hat{x} + \sin\phi\hat{y}) + \cos\theta\hat{z}$ construct the state corresponding to the $+\hbar/2$ eigenvalue, called $|+n\rangle$, by explicit rotation of the state $|+z\rangle$. Use the formula given in for the rotation operator about an arbitrary axis in the direction $\hat{n}$:

$$\hat{R}^s(\alpha\hat{n}) = \hat{I}\cos\frac{\alpha}{2} - i\vec{\sigma}\cdot\hat{n}\sin\frac{\alpha}{2}$$

$\hat{I}$ is the unit matrix and $\vec{\sigma} = \sigma_x\hat{x} + \sigma_y\hat{y} + \sigma_z\hat{z}$.
Compare with the result given in the textbook. Are they the same?