1) a) Make a sketch similar to Fig. 8.14 for \( S \) showing the two possible orientations of the spin vector.

b) What is the angle between these & the \( z \) axis?

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For \( S \)

\[
|S| = \sqrt{S(S+1)} \hbar = \frac{\sqrt{3}}{2} \hbar \approx 0.866
\]

\( S_z = \pm \frac{1}{2} \hbar \)

Thus the diagram is

The angle from the \( z \) axis is that of the \( 1 - 2 - \sqrt{3} \) triangle with 2 at the opposite side.