

# Solution

Name:

## Quiz 5

1. What is the commutator  $[L_x L_y, L_z]$ ?

$$\begin{aligned} & L_x [L_y, L_z] + [L_x, L_z] L_y \\ &= i\hbar L_x^2 - i\hbar L_y^2 \end{aligned}$$

2. What is the angular momentum matrix element  $\langle 2, 0 | J_y | 2, 1 \rangle$ ?

$$\begin{aligned} \bar{J}_y &= \frac{J_+ - J_-}{2i} \\ \langle 2, 0 | \frac{J_+ - J_-}{2i} | 2, 1 \rangle &= \frac{i}{2} \langle 2, 0 | J_- | 2, 1 \rangle \\ &= \frac{i}{2} \hbar \sqrt{2(2+1) - 1(1-1)} \\ &= i\hbar \frac{\sqrt{3}}{\sqrt{2}} \end{aligned}$$