Quiz 5

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

$$L_x [L_y, L_z] + [L_x, L_z] L_y$$

$$= i\hbar L_x^2 - i\hbar L_y^2$$

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

$$J_y = \frac{J_+ - J_-}{2i}$$

$$\langle 2, 0| \frac{J_+ - J_-}{2i} |2, 1\rangle = \frac{i}{2} \langle 2, 0 | J_- |2, 1\rangle$$

$$= \frac{i}{2} \hbar \sqrt{2(2+1) - 1(1-1)}$$

$$= i\hbar \sqrt{\frac{3}{2}}$$