Angular momentum 1

Let $\mathbf{L}$ be the angular momentum operator

$$\mathbf{L} = \mathbf{r} \times \mathbf{p} = \begin{pmatrix} L_x \\ L_y \\ L_z \end{pmatrix}$$

From the cross product we have

$$L_x = y p_z - z p_y$$
$$L_y = z p_x - x p_z$$
$$L_z = x p_y - y p_x$$

Verify the commutation relations

$$[L_x, L_y] = i\hbar L_z$$
$$[L_y, L_z] = i\hbar L_x$$
$$[L_z, L_x] = i\hbar L_y$$

Let L^2 be the magnitude squared of $\mathbf{L}$.

$$L^2 = |\mathbf{L}|^2 = L_x{}^2 + L_y{}^2 + L_z{}^2$$

Verify the commutation relations

$$[L_x, L^2] = [L_y, L^2] = [L_z, L^2] = 0$$

Eigenmath script