Question 1

A ray of light traveling with direction vector

$$v = \begin{bmatrix} a \\ b \\ c \end{bmatrix}$$

in Euclidean space (R^3) bounces off a mirror within the xy-plane.

1. What is the direction vector of the ray after it bounces off the mirror?

2. What is the angle between v and the mirror?

Question 2

Now assume a ray of light with direction vector v bounces off a mirror in the plane given by the equation $x + y + z = 1$.

1. What is the direction vector of the ray after it bounces off the mirror?

2. What is the angle between v and the mirror?

Question 3

Finally, assume a ray of light v bounces off a spherical mirror at point

$$p = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$$

where the mirror is a perfect sphere centered at the origin. (The equation $x^2 + y^2 + z^2 = 1$ describes such a sphere.)

1. What is the direction vector of the ray after it bounces off the mirror?

2. What is the angle between v and the mirror?