({{question\_number}}) With respect to cartesian coordinates O, a laser beam ABC is fired from the point A(1, 2, 4), and is reflected at point B off the plane with equation , as shown in Fig. 8. A′ is the point (2, 4, 1), and M is the midpoint of AA′.

Diagram

Description automatically generated

Fig. 8

**(i)** Show that AA′ is perpendicular to the plane , and that M lies in the plane. **[4]**

The vector equation of the line AB is .

**(ii)** Find the coordinates of B, and a vector equation of the line A′ B. **[6]**

**(iii)** Given that A′ BC is a straight line, find the angle . **[4]**

**(iv)** Find the coordinates of the point where BC crosses the O plane (the plane containing the - and

-axes). **[3]**