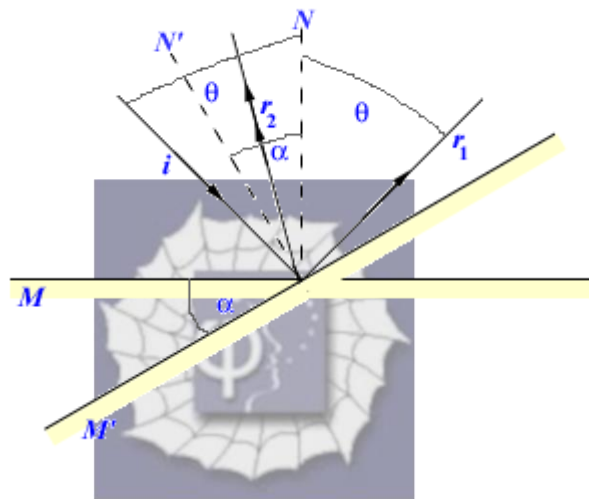


598.

Problem 43.29 (RHK)

We have to prove that if a plane mirror is rotated through an angle α , the reflected beam is rotated through an angle 2α .



Solution:

Let M be the initial position of the mirror. Let the incident ray i make an angle θ with the normal N to M . By the law of reflection from plane mirrors we note that the reflected ray r_1 will be at angle θ with respect to the normal N ; as shown in the figure.

Let the mirror be rotated by an angle α . As shown in the figure the normal N' to the new position of the mirror M' has turned by angle α from N . The angle of incidence of

the ray i with respect to the normal N' is $(\theta - \alpha)$. The incident ray i is reflected by the mirror as ray r_2 . The angle that ray r_2 makes with the normal N' will be $(\theta - \alpha)$. The angle that r_2 makes with the normal N will be $(\alpha - (\theta - \alpha) = 2\alpha - \theta)$. Therefore, angle between r_2 and r_1 will be $((2\alpha - \theta) + \theta = 2\alpha)$. Thus we have proved that if a plane mirror is turned by an angle α the reflected ray turns by angle 2α .

