# UNIVERSITY IBN TOFAIL

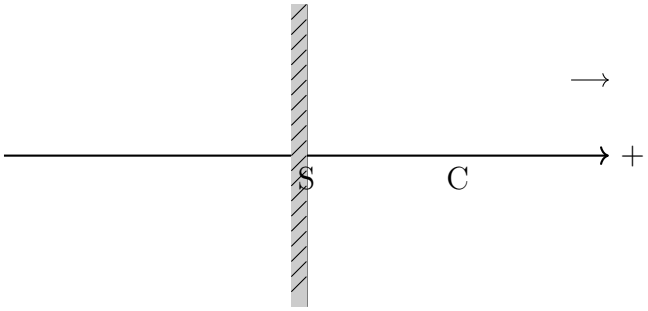
*Optics*

*Problem Set II*

## Exercise 1: Mirror

Consider a convex spherical mirror with center C, vertex S, and radius R = 1.5 m.

1. Provide the conjugation relation and the magnification relation with origin at vertex S.
2. Application: Find the position and nature of an object AB when its image A'B' is real, upright, and three times larger than the object.




**Correction**

## Exercise 2: Plane Mirror

1. Determine the position and nature of the image of a real object produced by a plane mirror. Same question for a virtual object.
2. Consider two perpendicular plane mirrors. How many images does object A have?
3. Consider an object placed between two parallel mirrors. How many images does the object have?
4. A real object AB is placed at a distance AH = 20 cm from a plane mirror. Where is the image A'B' of AB given by the mirror? What is its nature?
5. Compare the size of A'B' and AB.
6. Draw the image A'B' of AB given by the mirror using light rays emitted from points A and B and reflecting on the mirror.

**Correction**

# Exercise 3: Spherical Mirror

Prove the following statements:

1. A concave spherical mirror always produces a real image of a virtual object.
2. The real image of a real object in a concave spherical mirror is always inverted.
3. A convex spherical mirror always produces a virtual image of a real object.
4. An object AB is placed in front of a concave spherical mirror with center C, vertex S, and radius 50 cm. Point A is located 1 m from vertex S.
   (a) Geometrically construct the image A'B' of AB.
   (b) Determine the position of A'.
   (c) Calculate the linear magnification and specify the nature of the image.

**Correction**