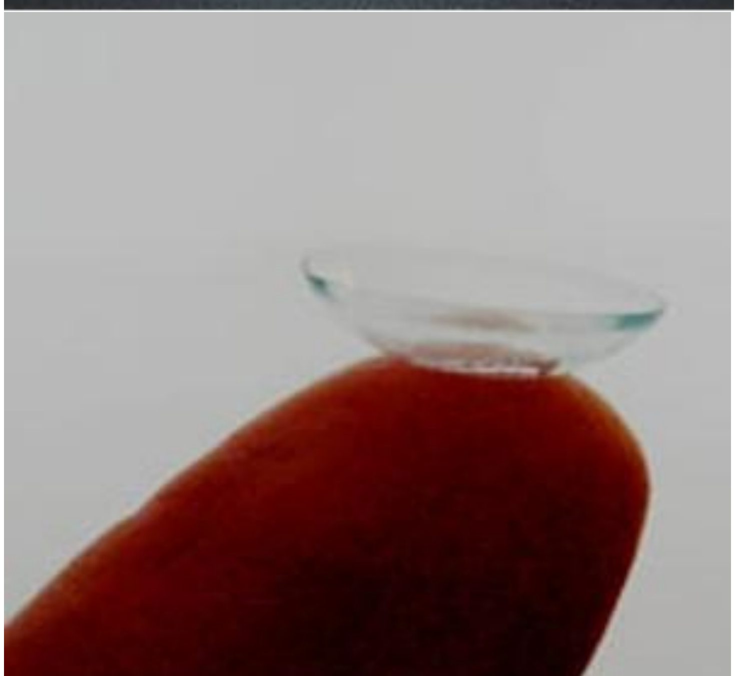
Chapitre 3

Lentilles minces

Assaous Boubaker


Southwell
Burton
Joyce
Cotgrave
West
Bridgford

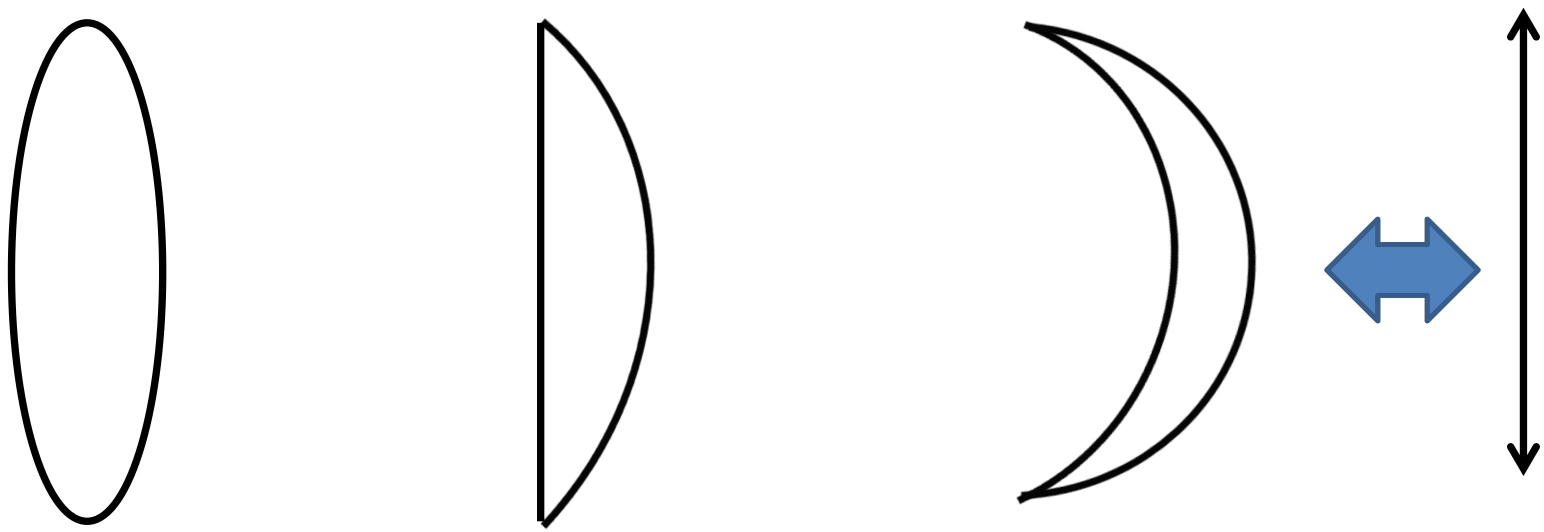


Chapitre 3

Les lentilles minces

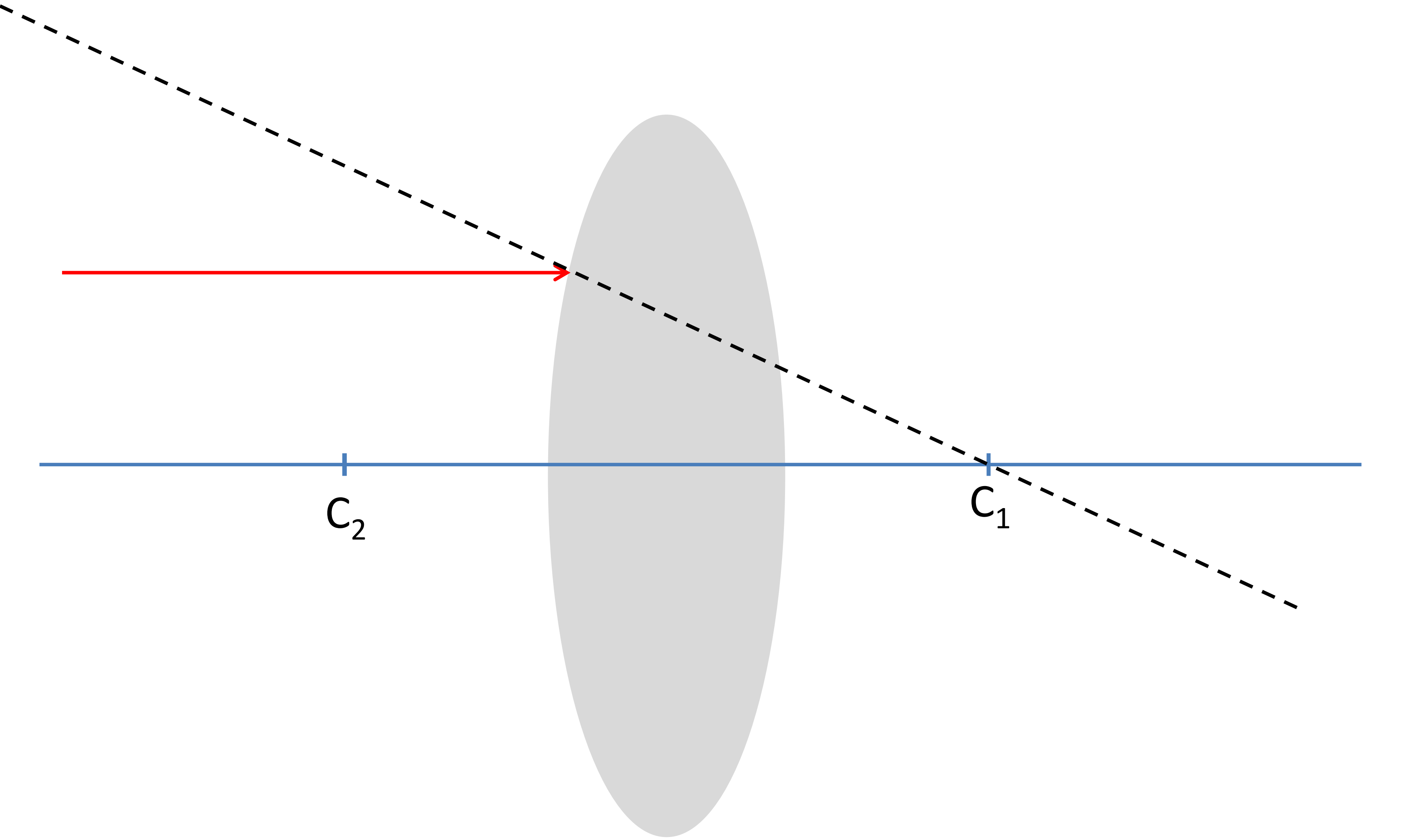
Définition: une lentille mince est un milieu transparent et homogène délimité par deux dioptres dont l'un d'eux au moins est sphérique

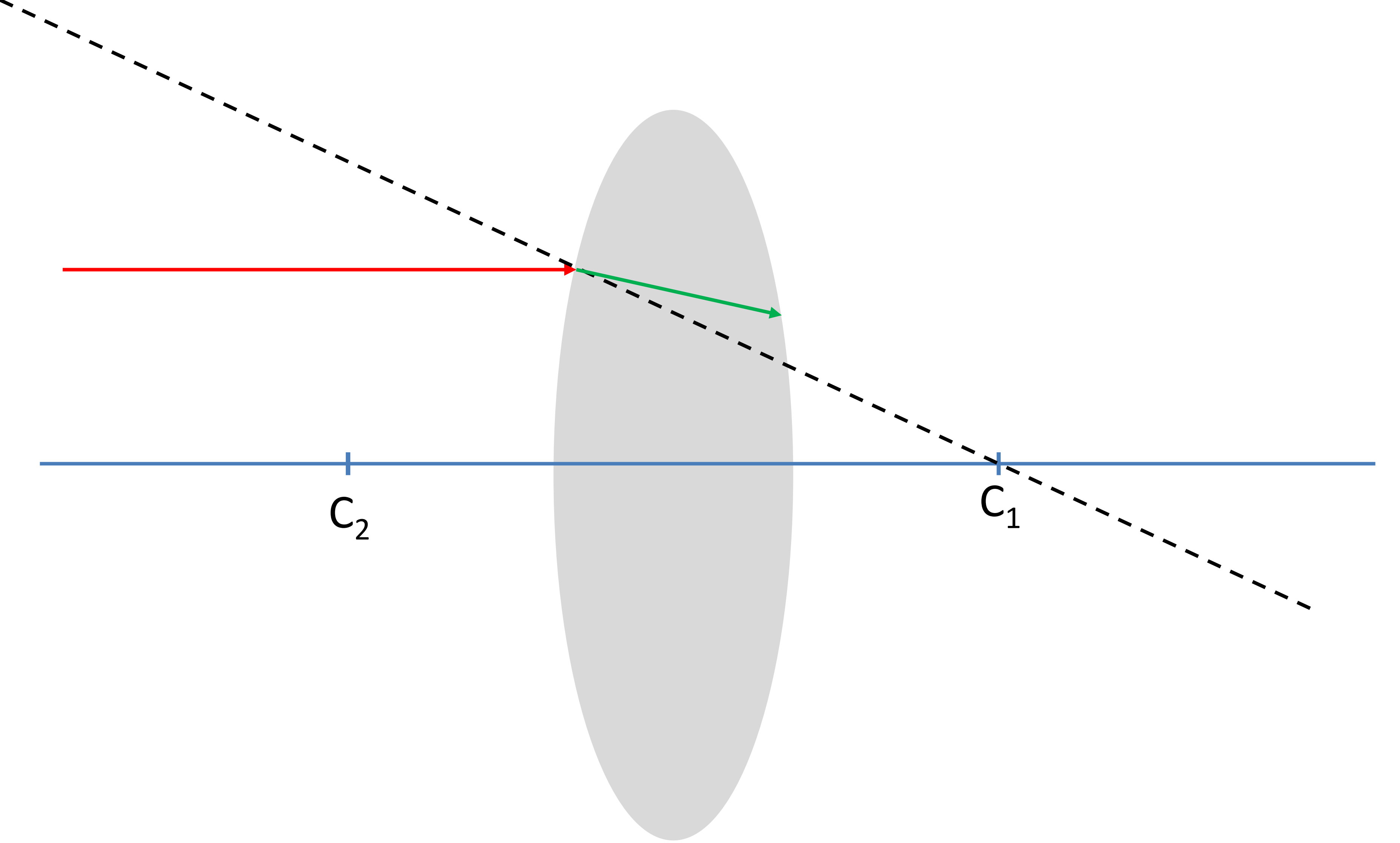
Lentilles convergentes



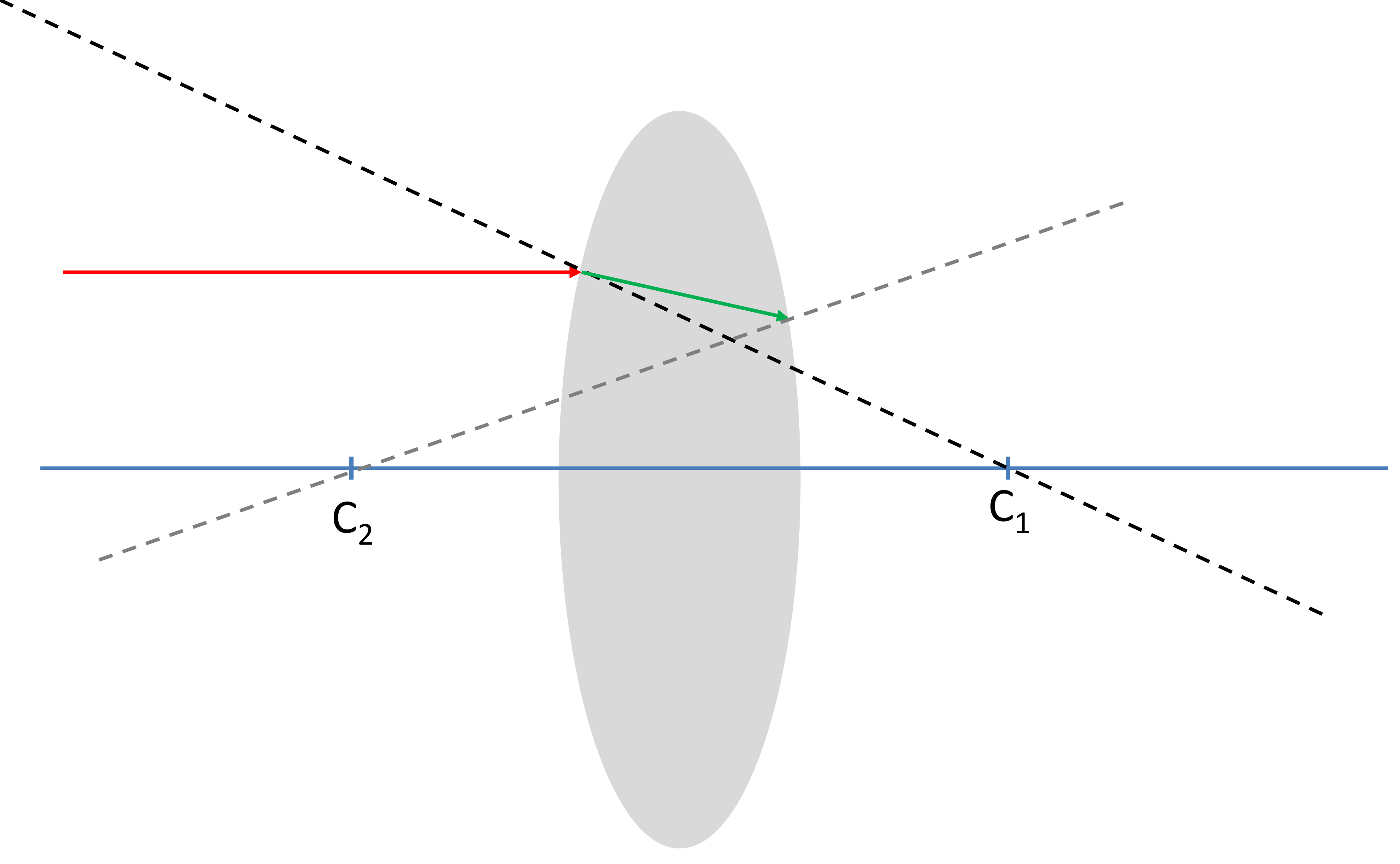
Biconvexe plan-convexe ménisque convergent

Marche d'un rayon // à l'axe optique à travers une lentille mince convergente:

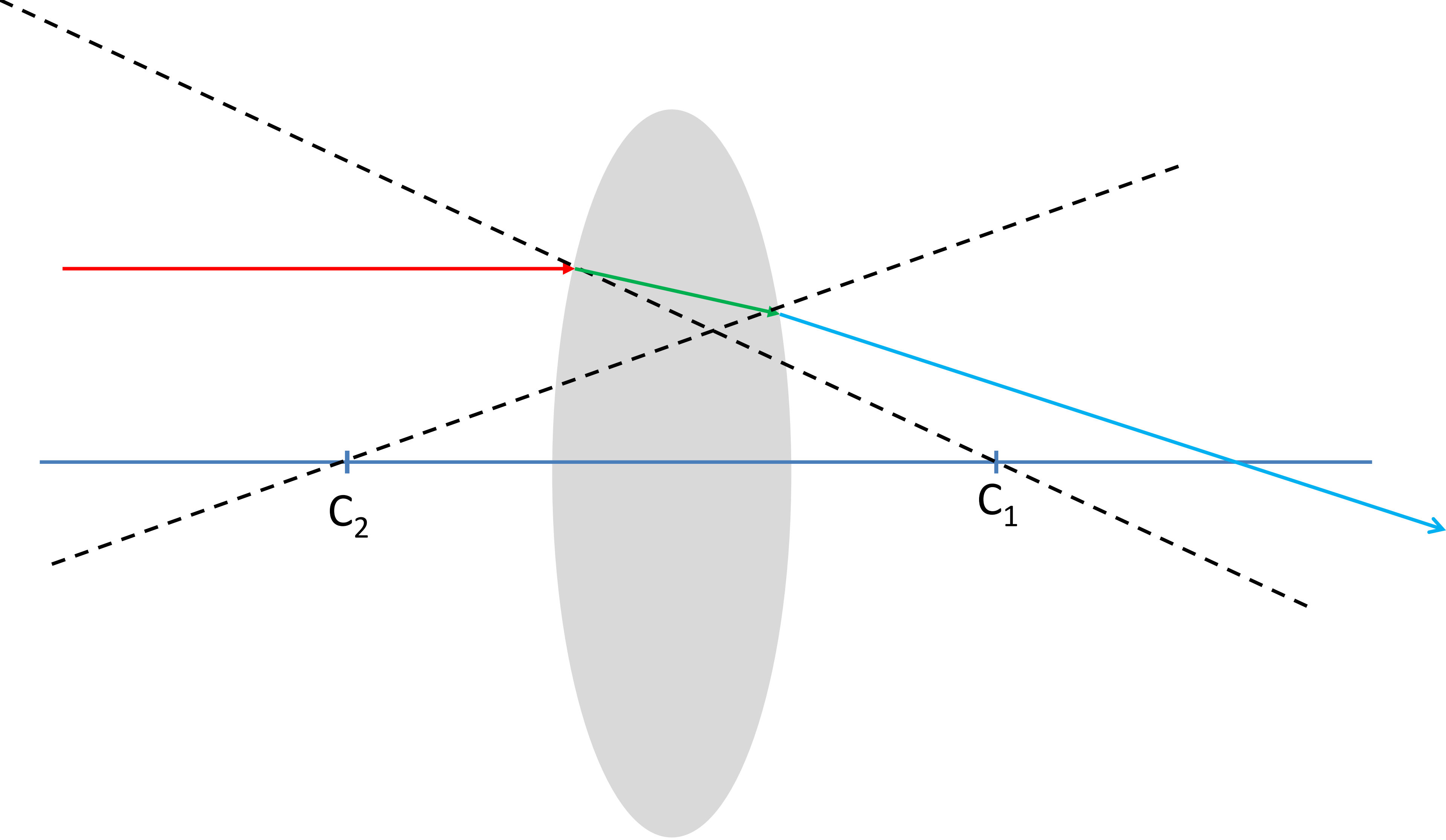




C_2
C_1

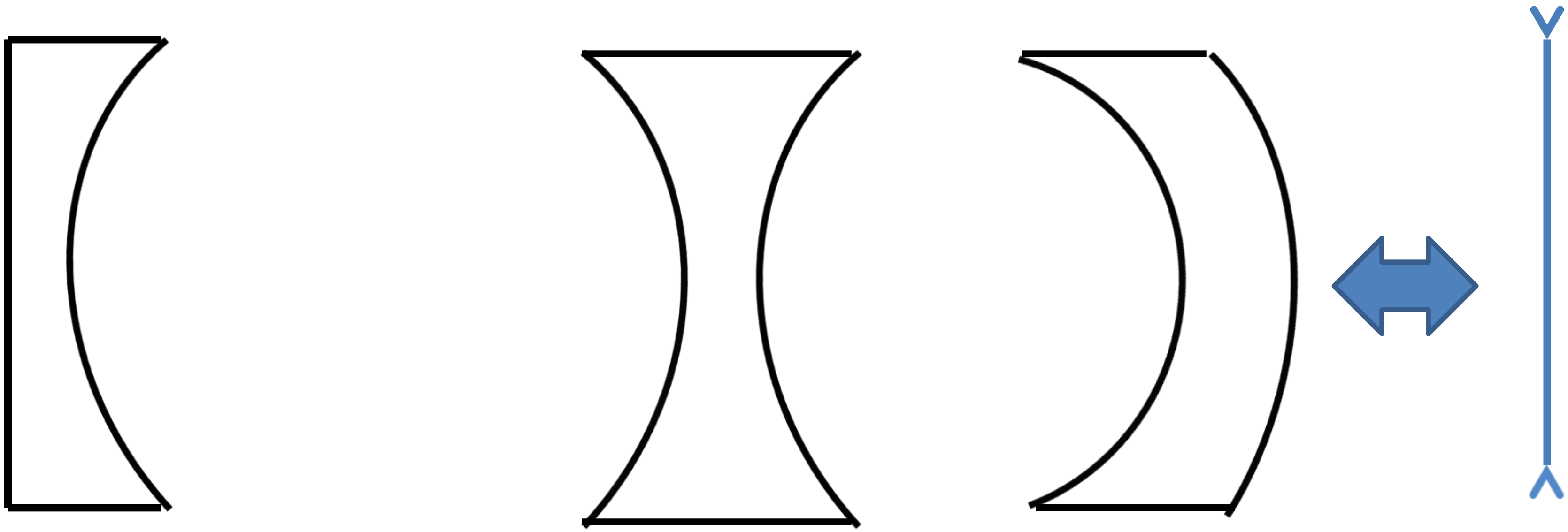


C_2
C_1



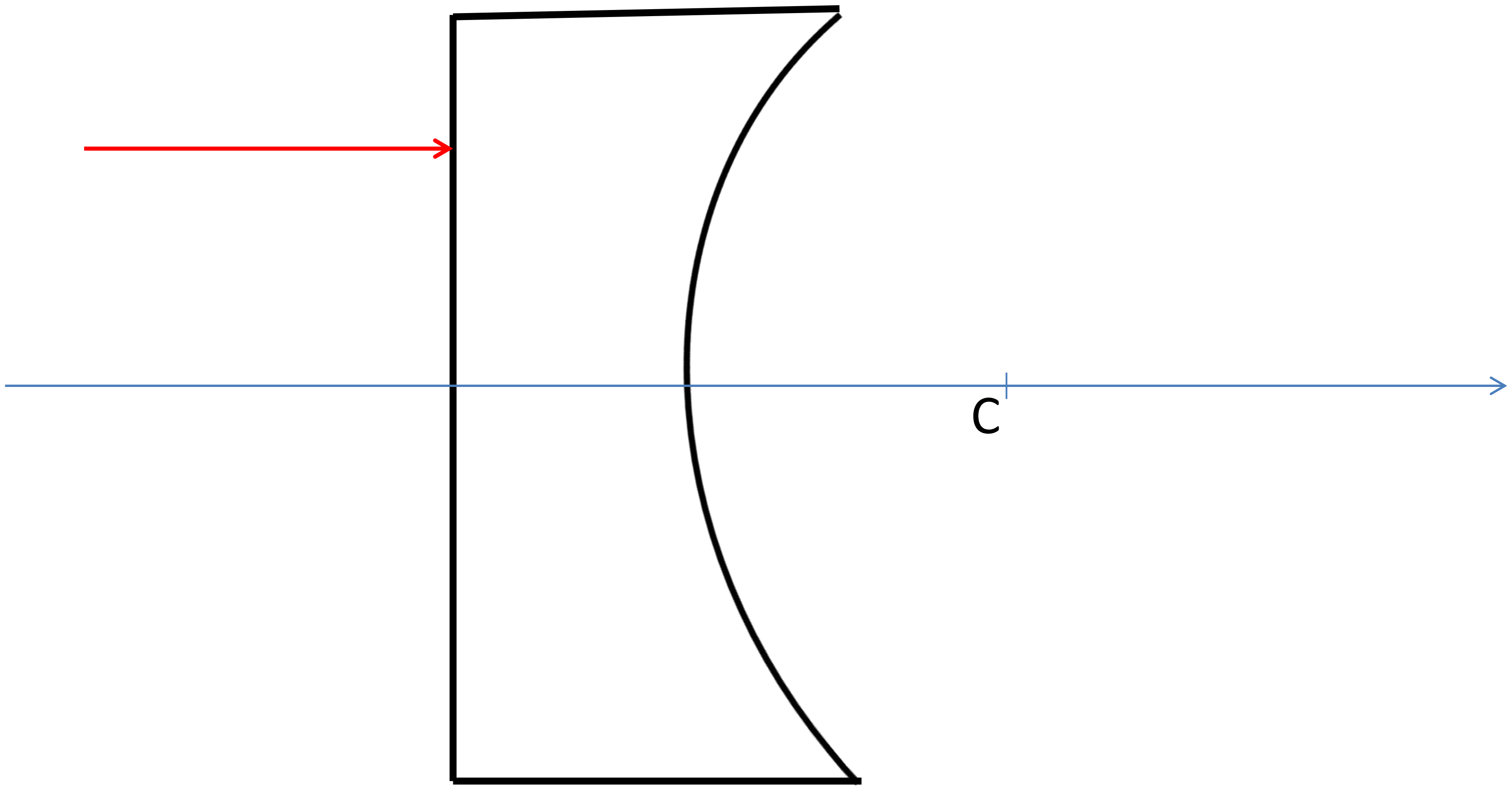
C_2
C_1

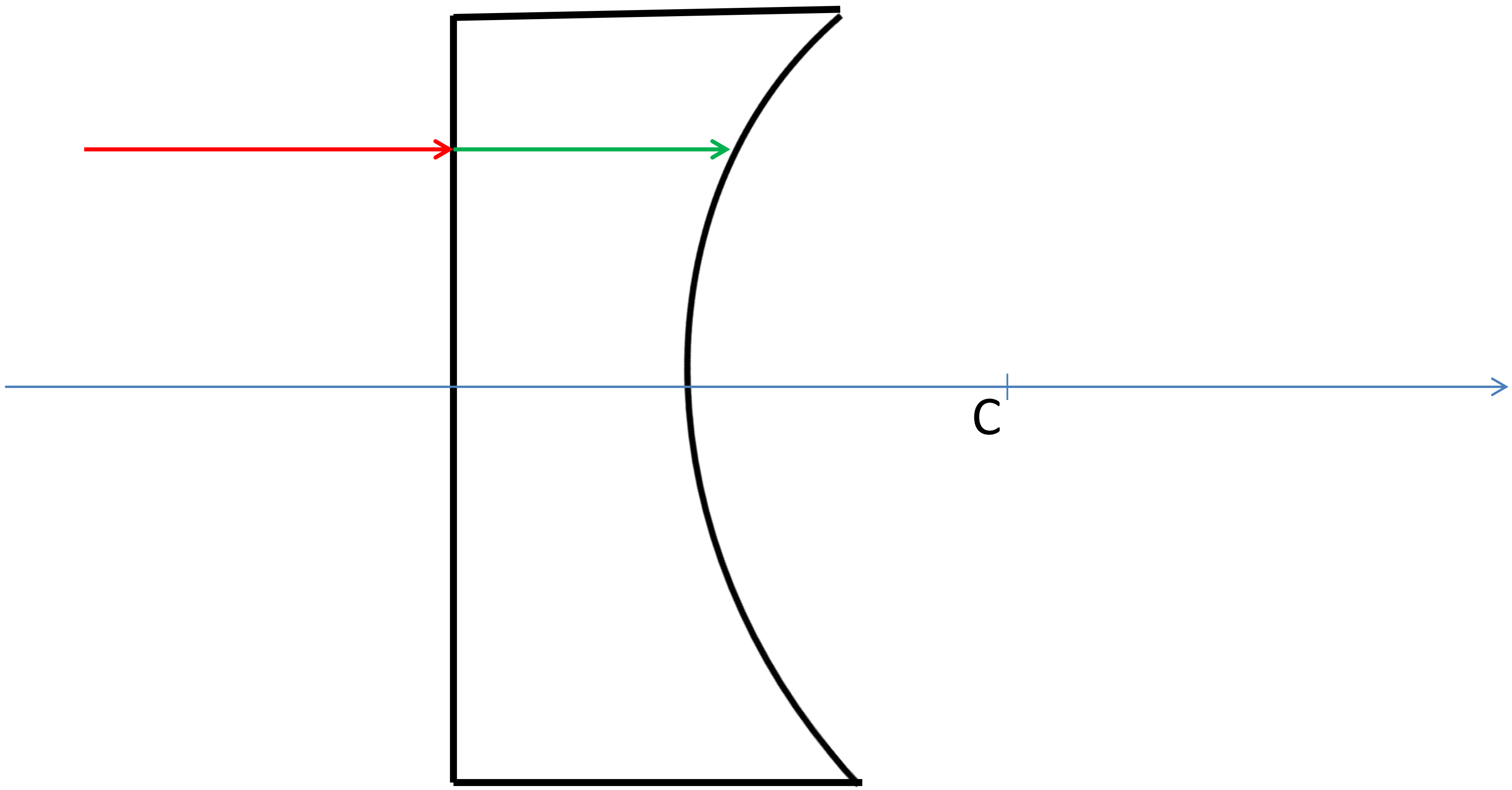
Lentille divergentes

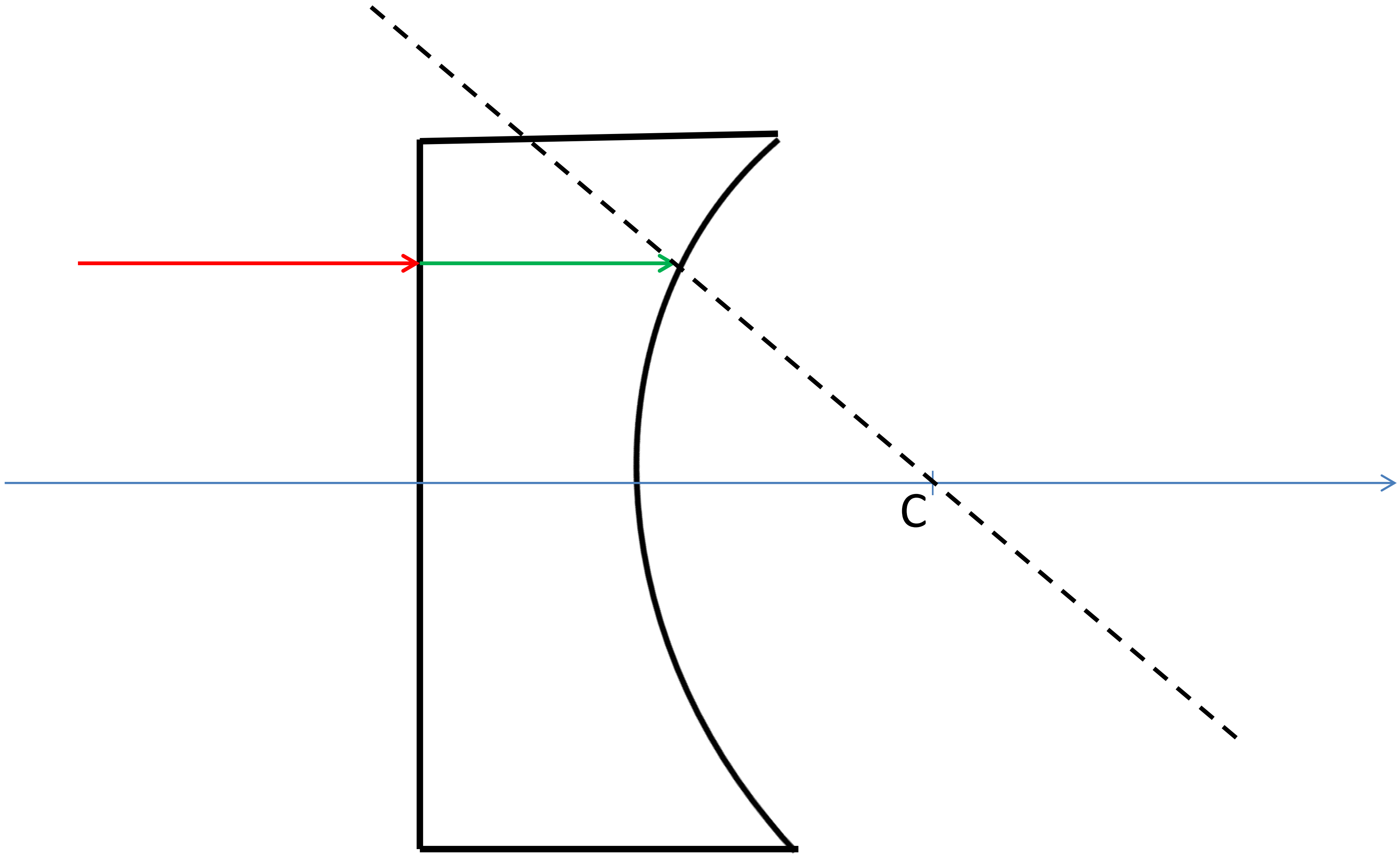


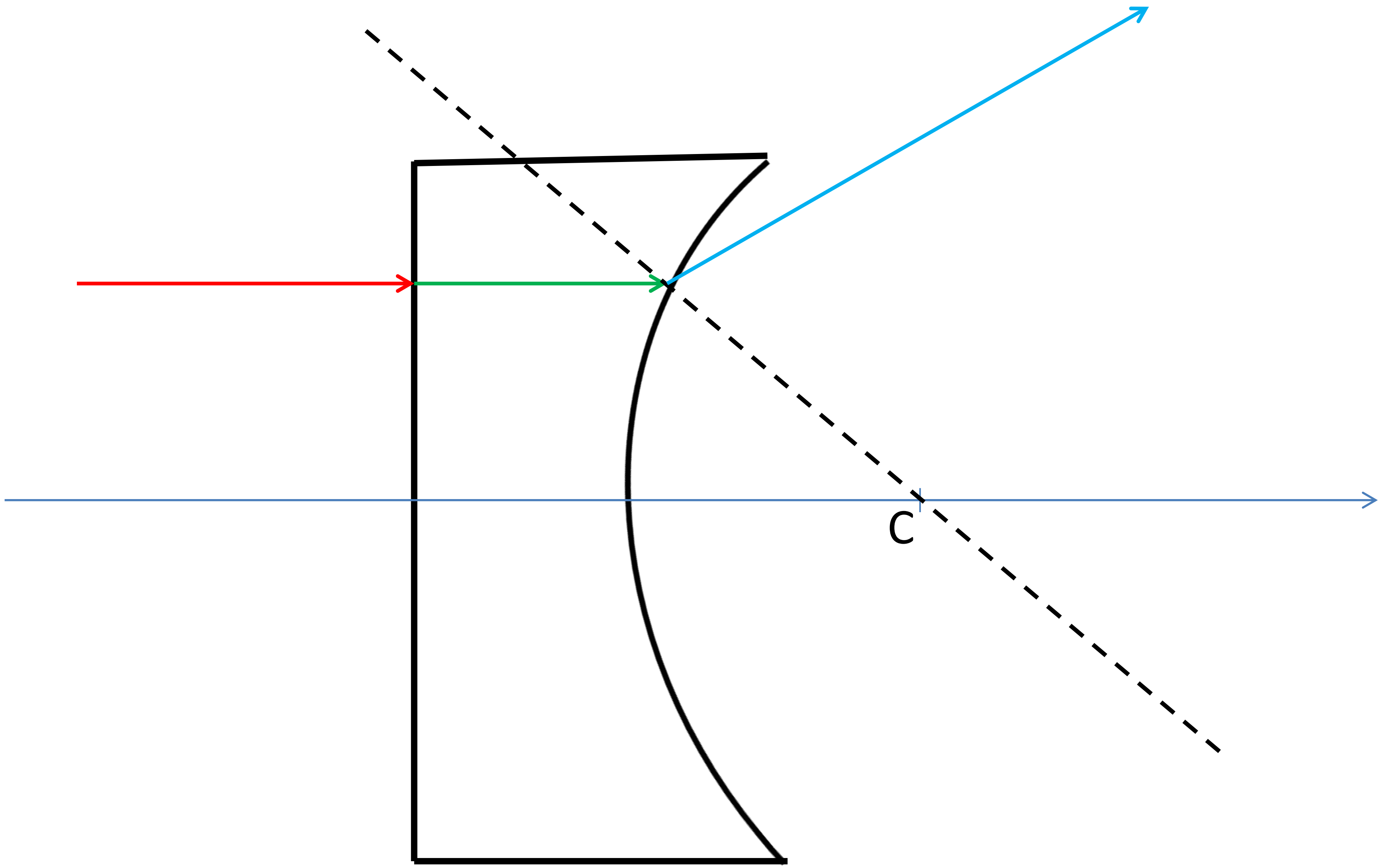
Plan-concave biconcave ménisque divergent

Marche d'un rayon // à l'axe optique à travers une lentille mince divergente:




C


C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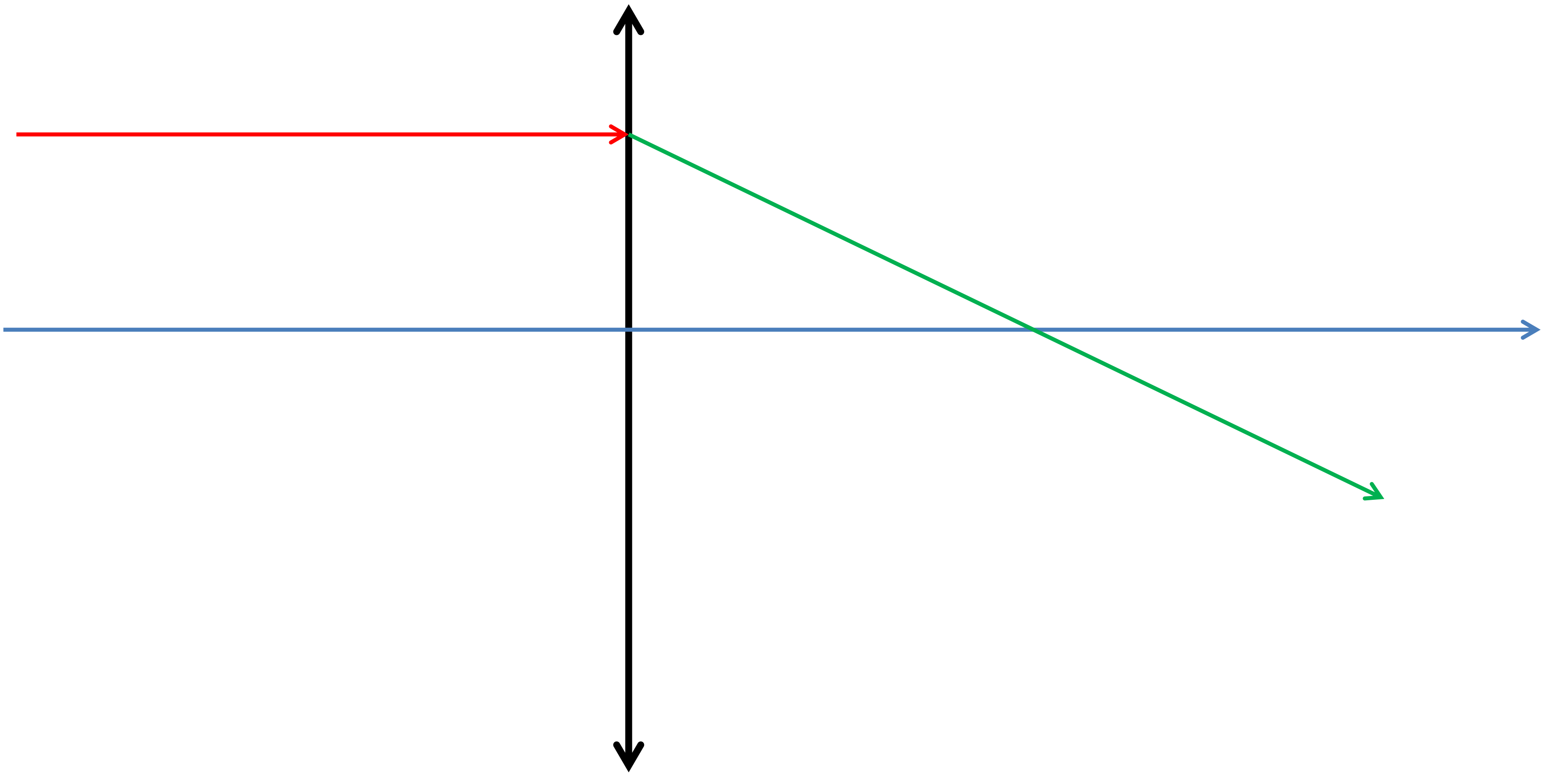
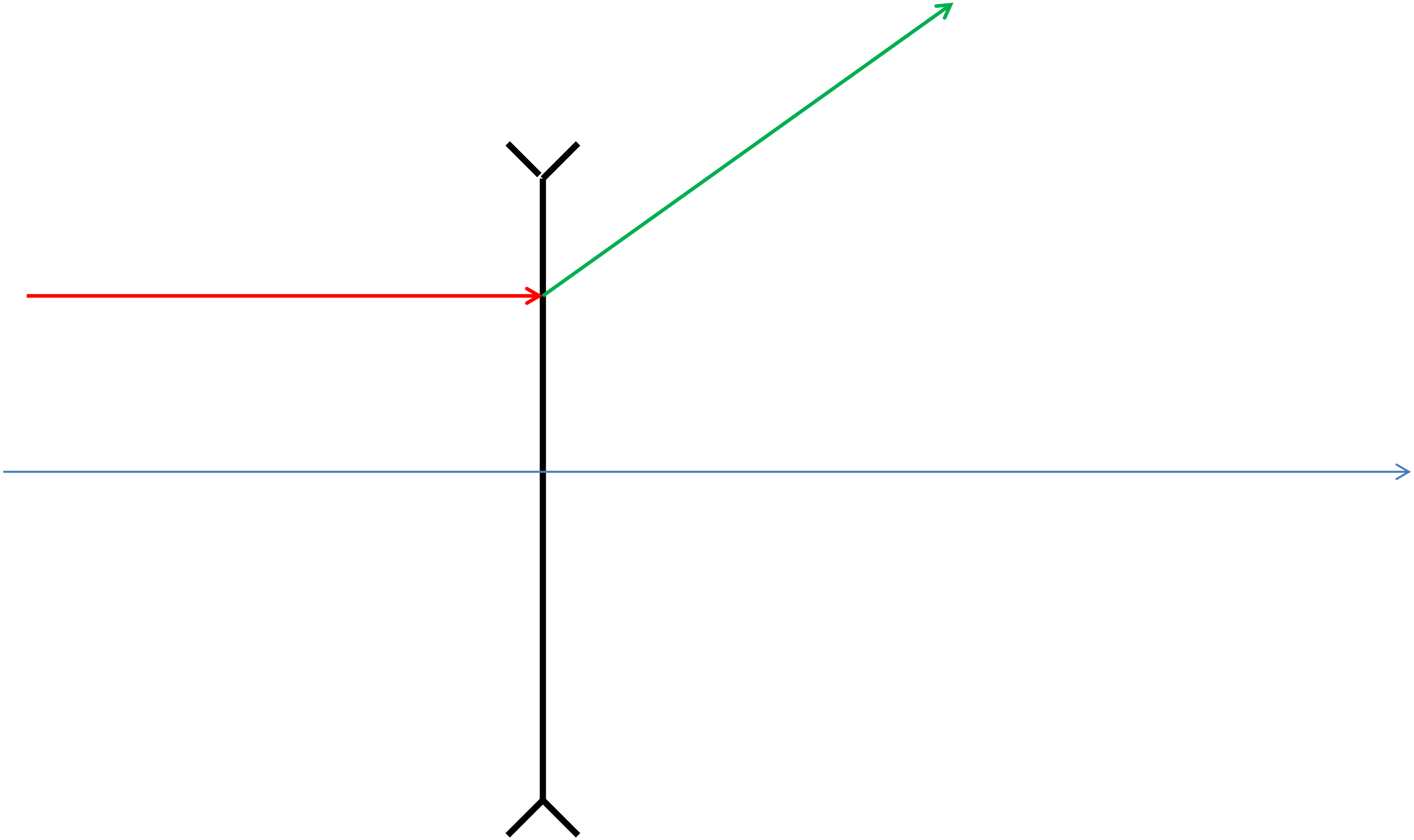
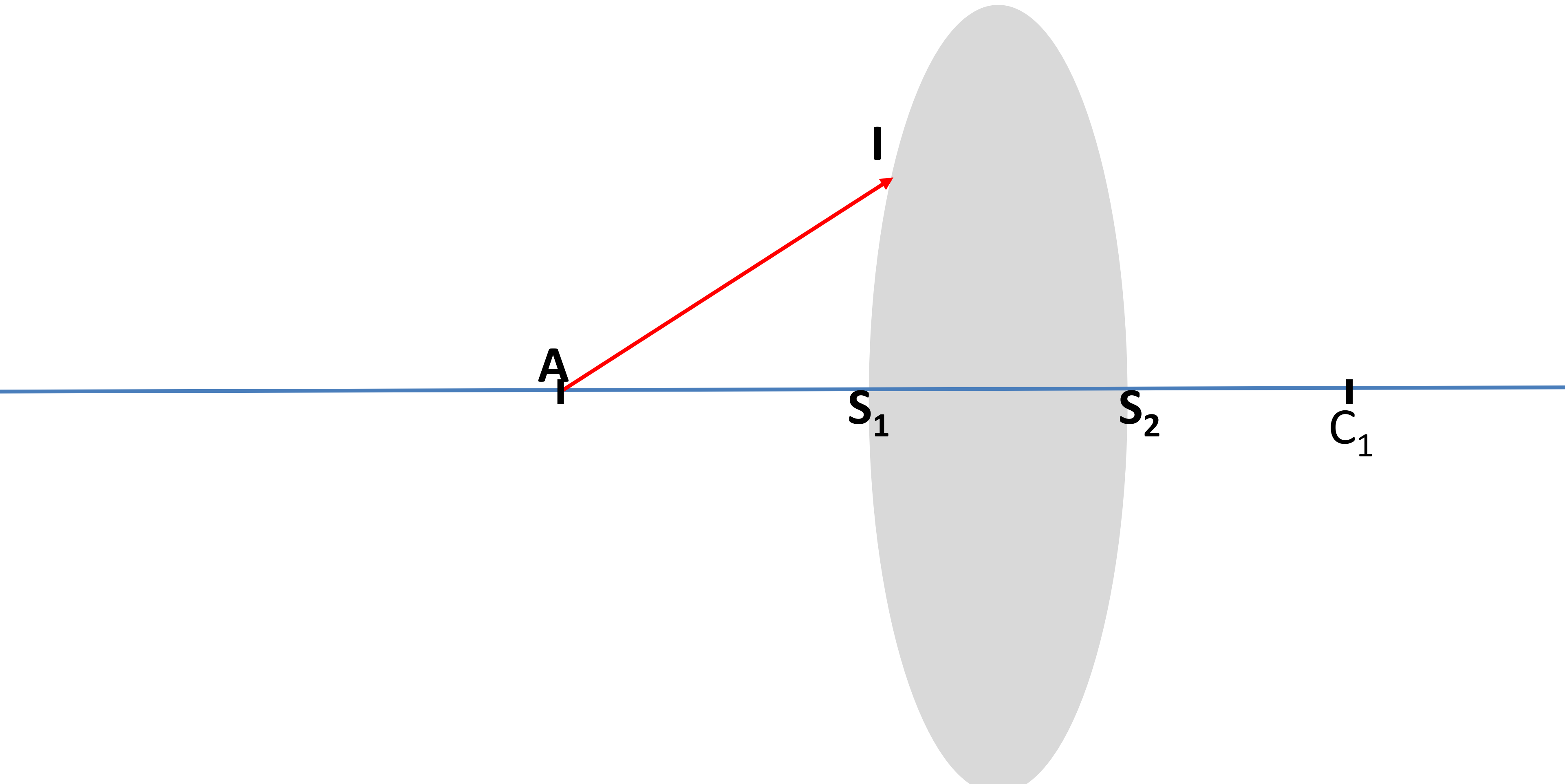


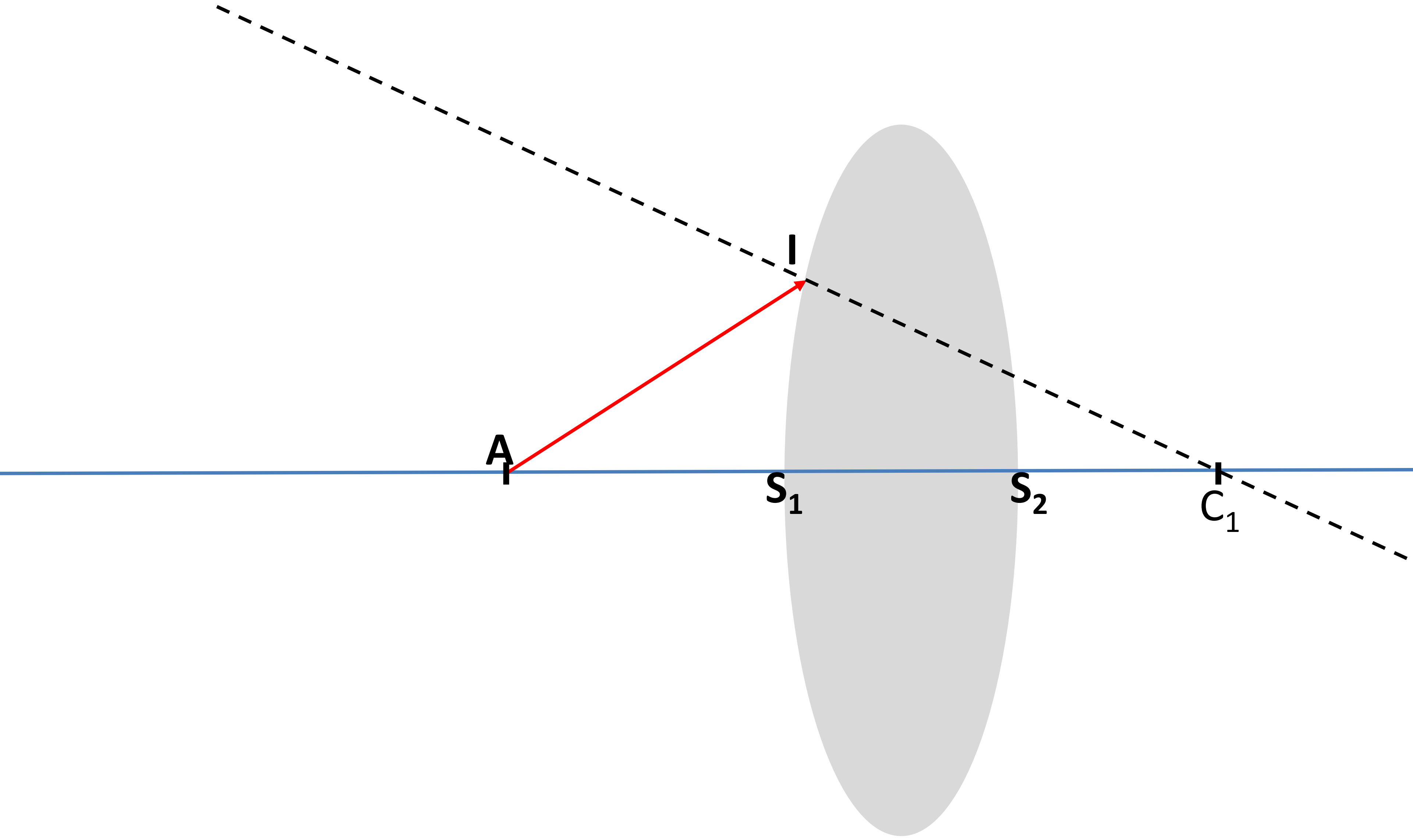
Lentille convergente



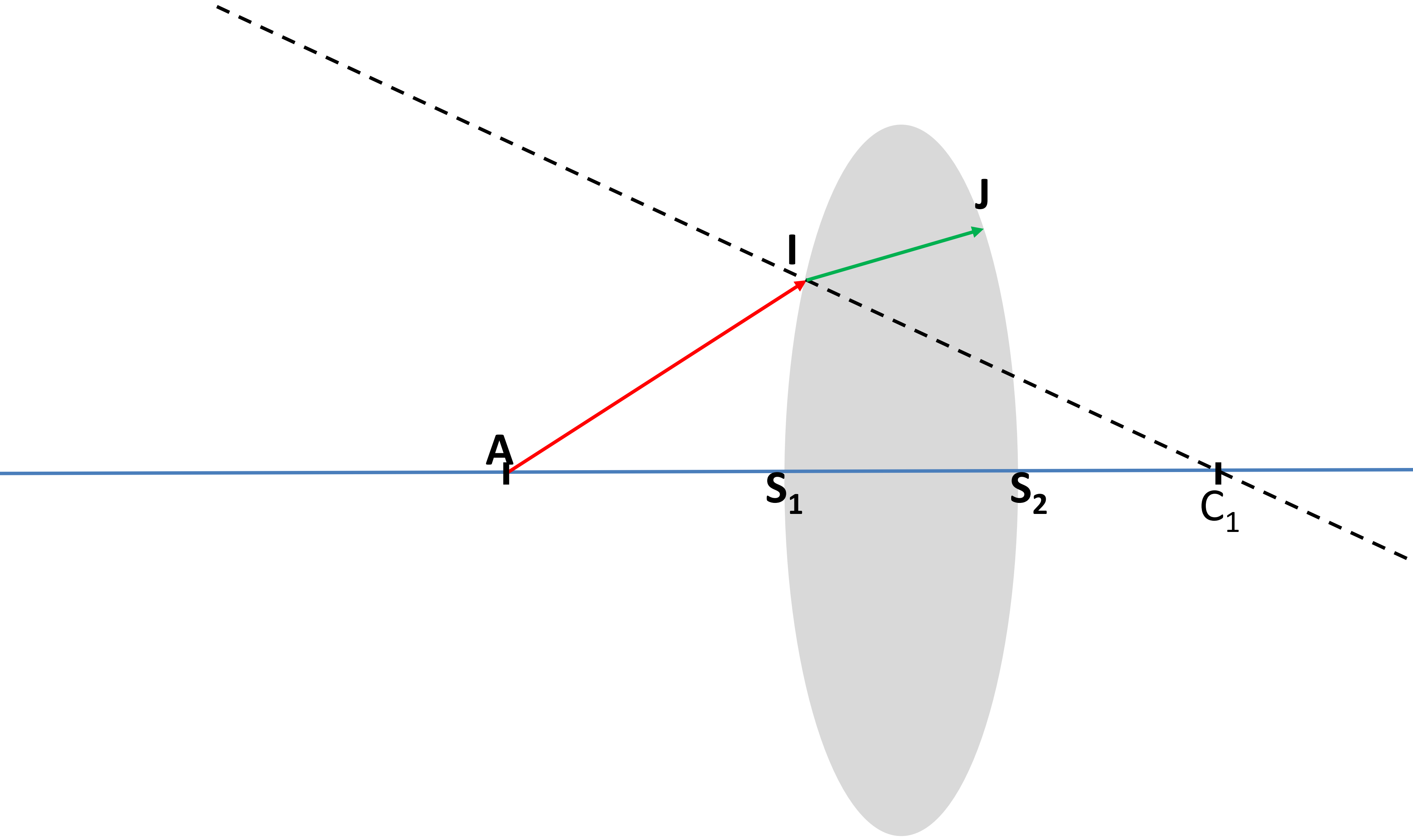
Lentille divergente

Relation de conjugaison d’une lentille mince

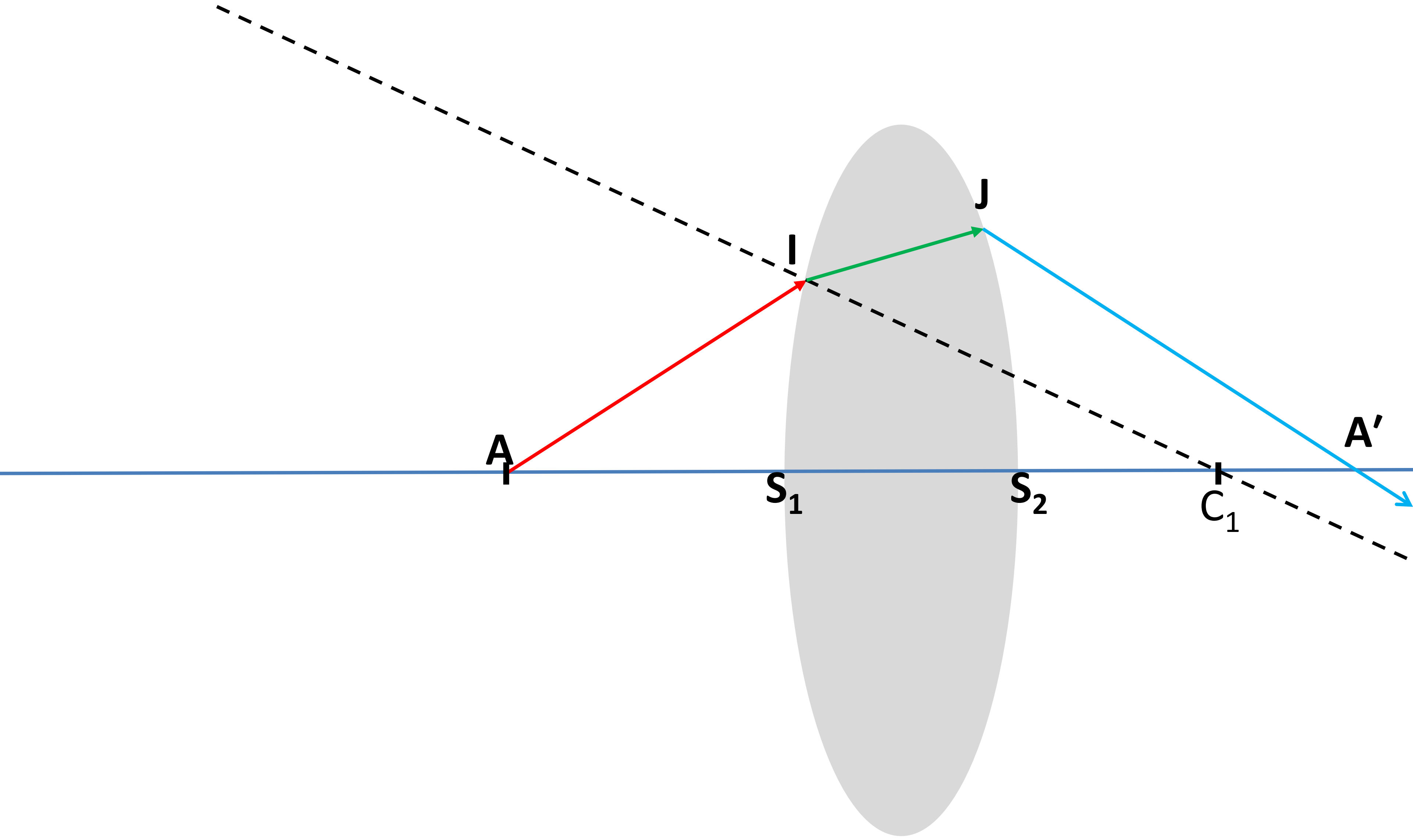

I
A
S_1
S_2
C_1

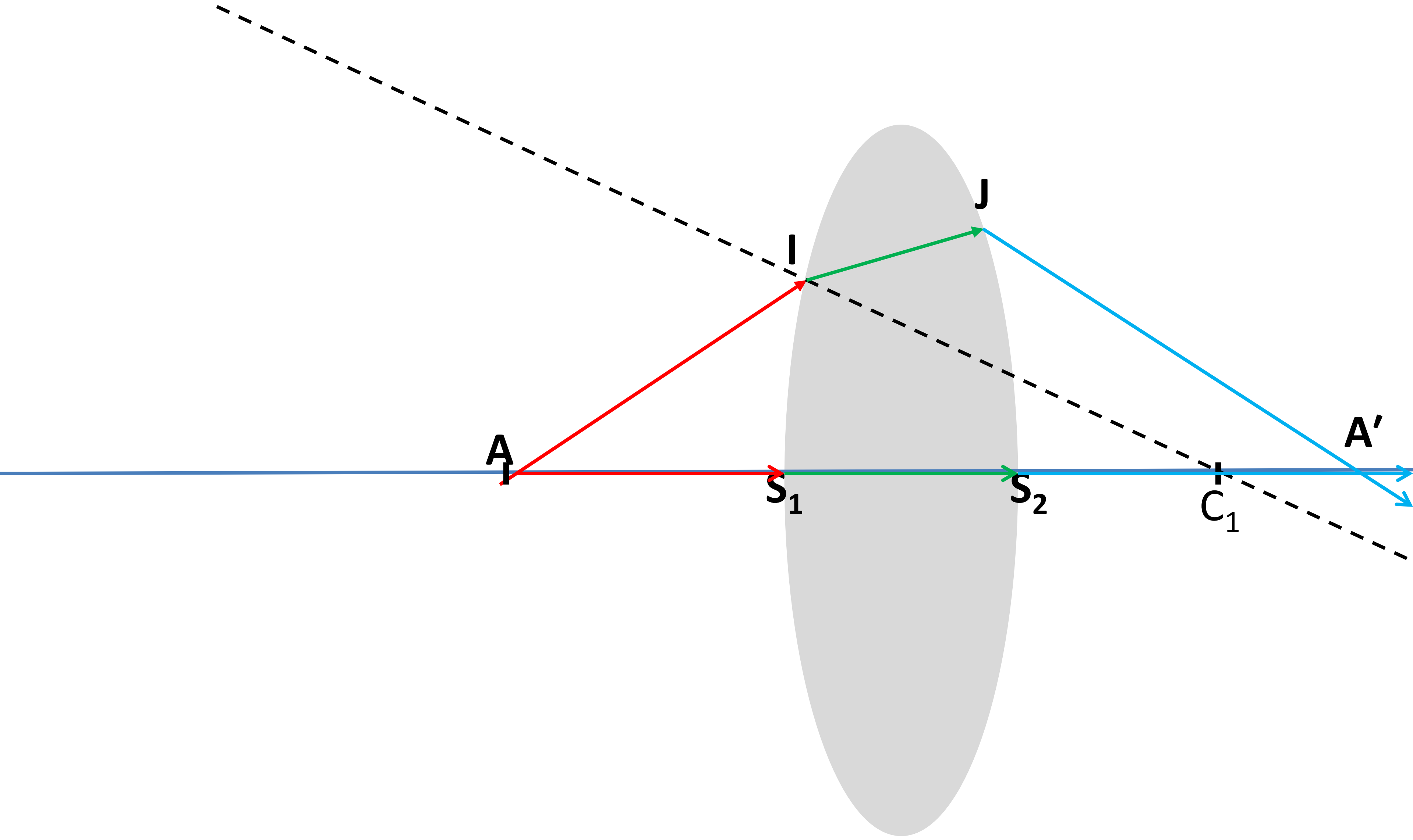


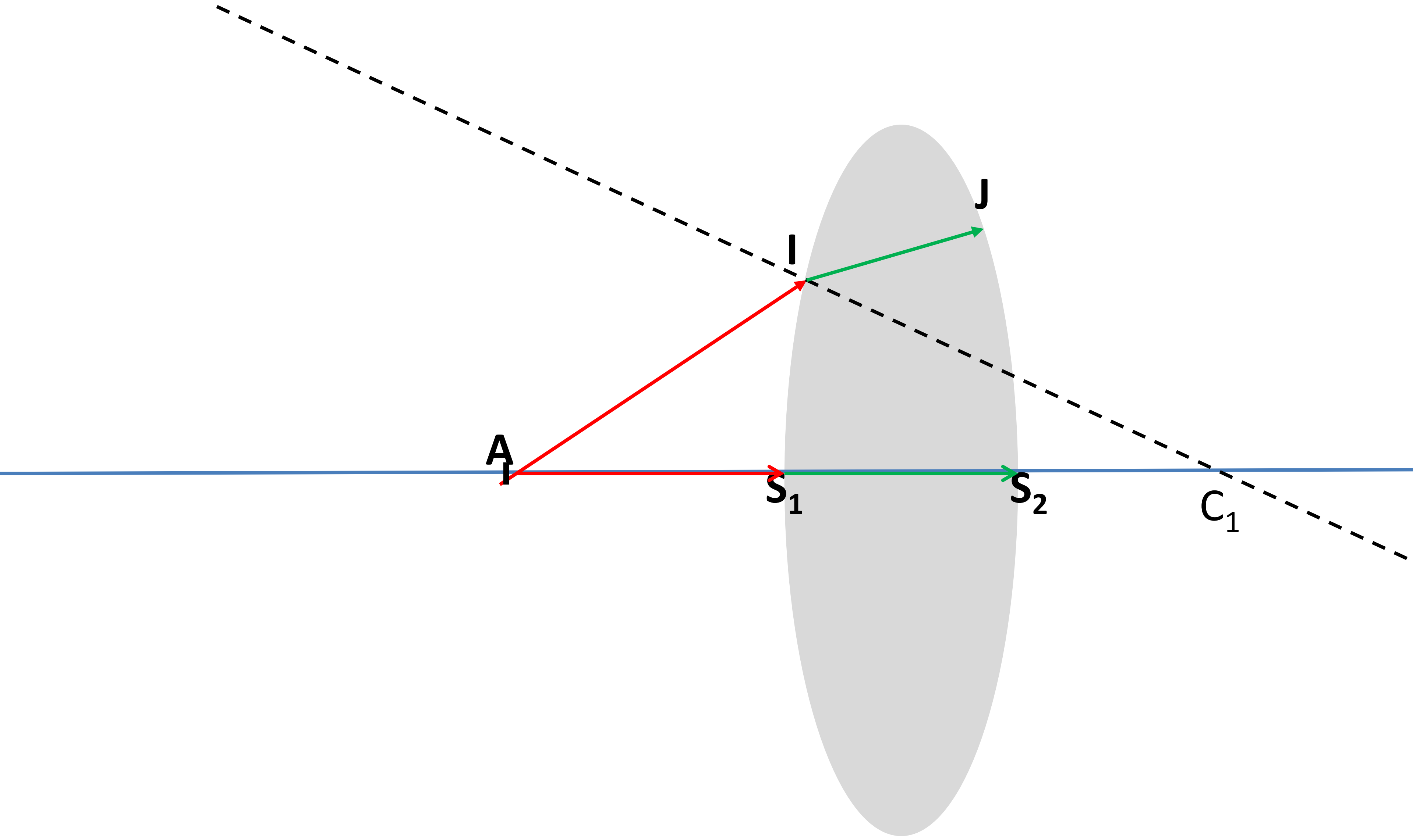
I
A
S1
S2
C1



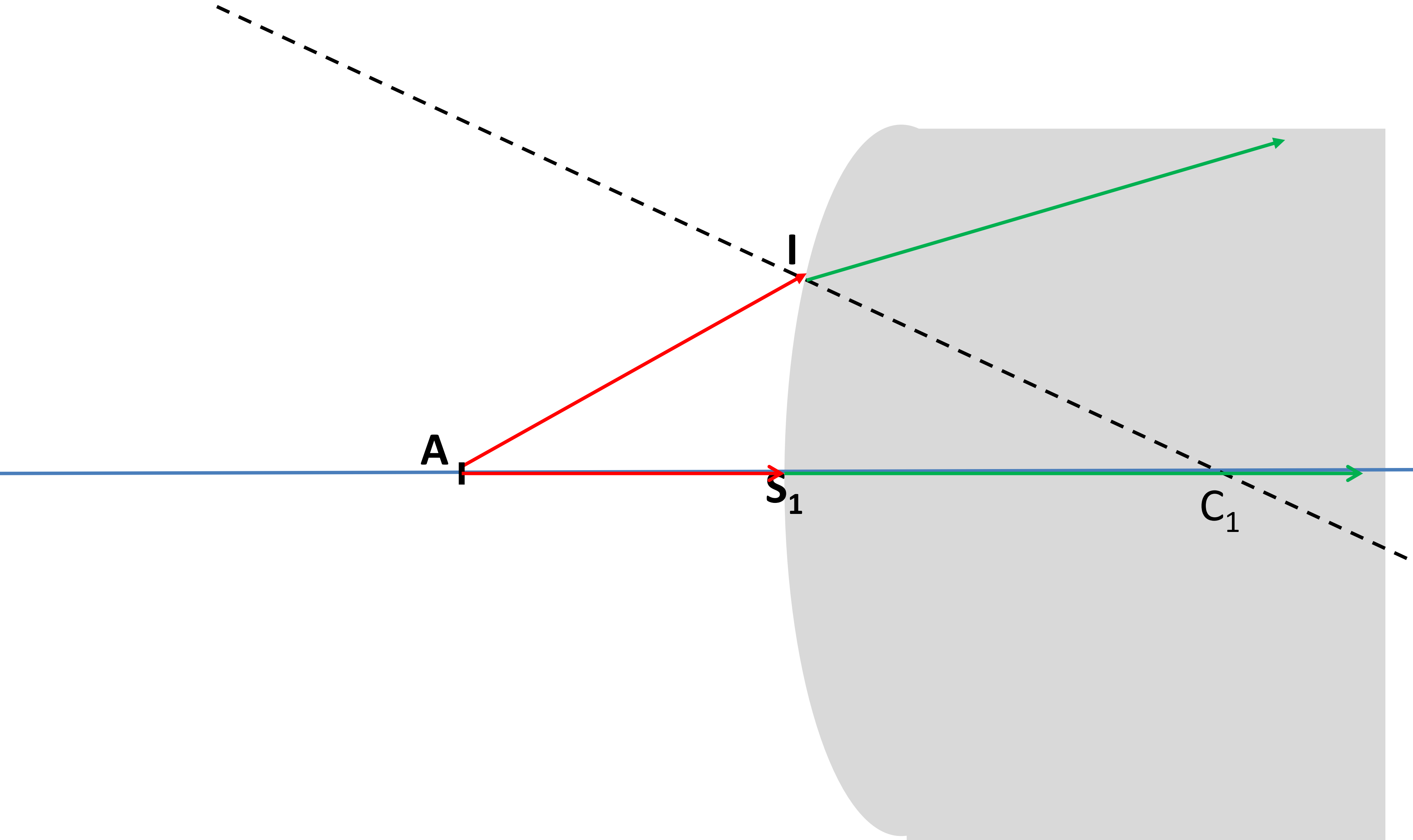
J
I
A
S_1
S_2
C_1


J
I
A
A′
S_1
S_2
C_1

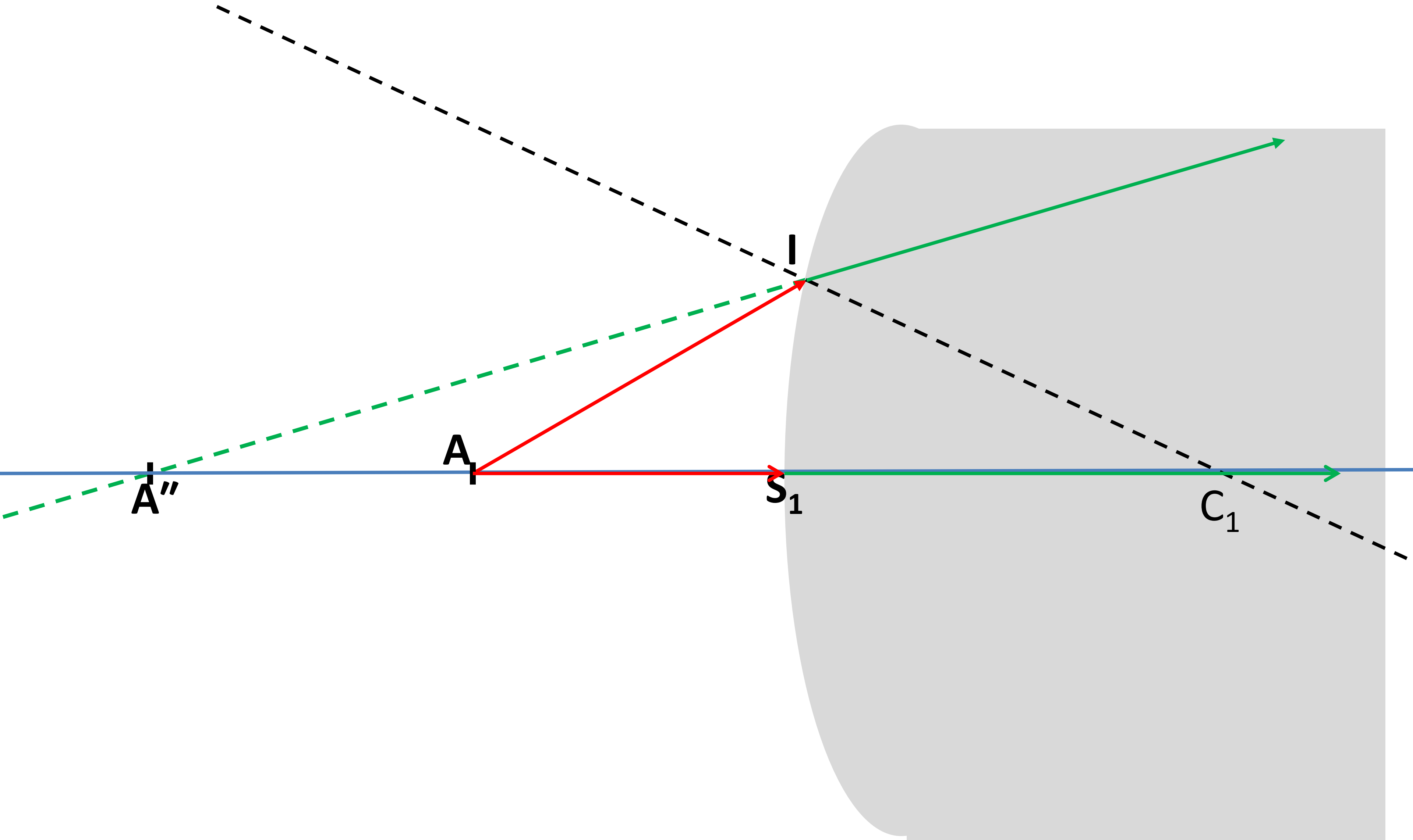

J
I
A
A'
S1
S2
C1



J
I
A
I
S1
S2
C1



I
A
S1
C1



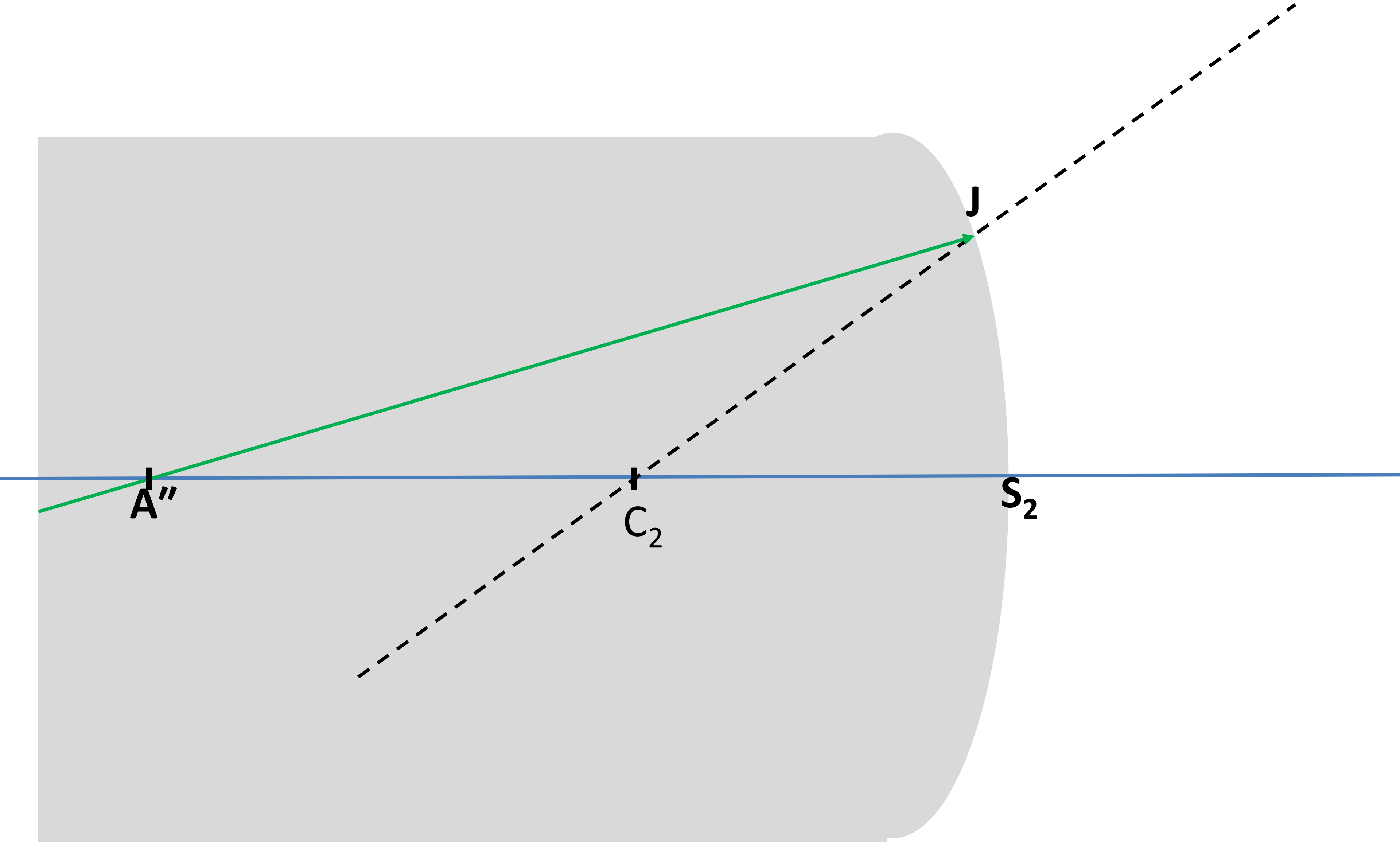
I
A
A''
S1
C1

On appliquant la relation de SD

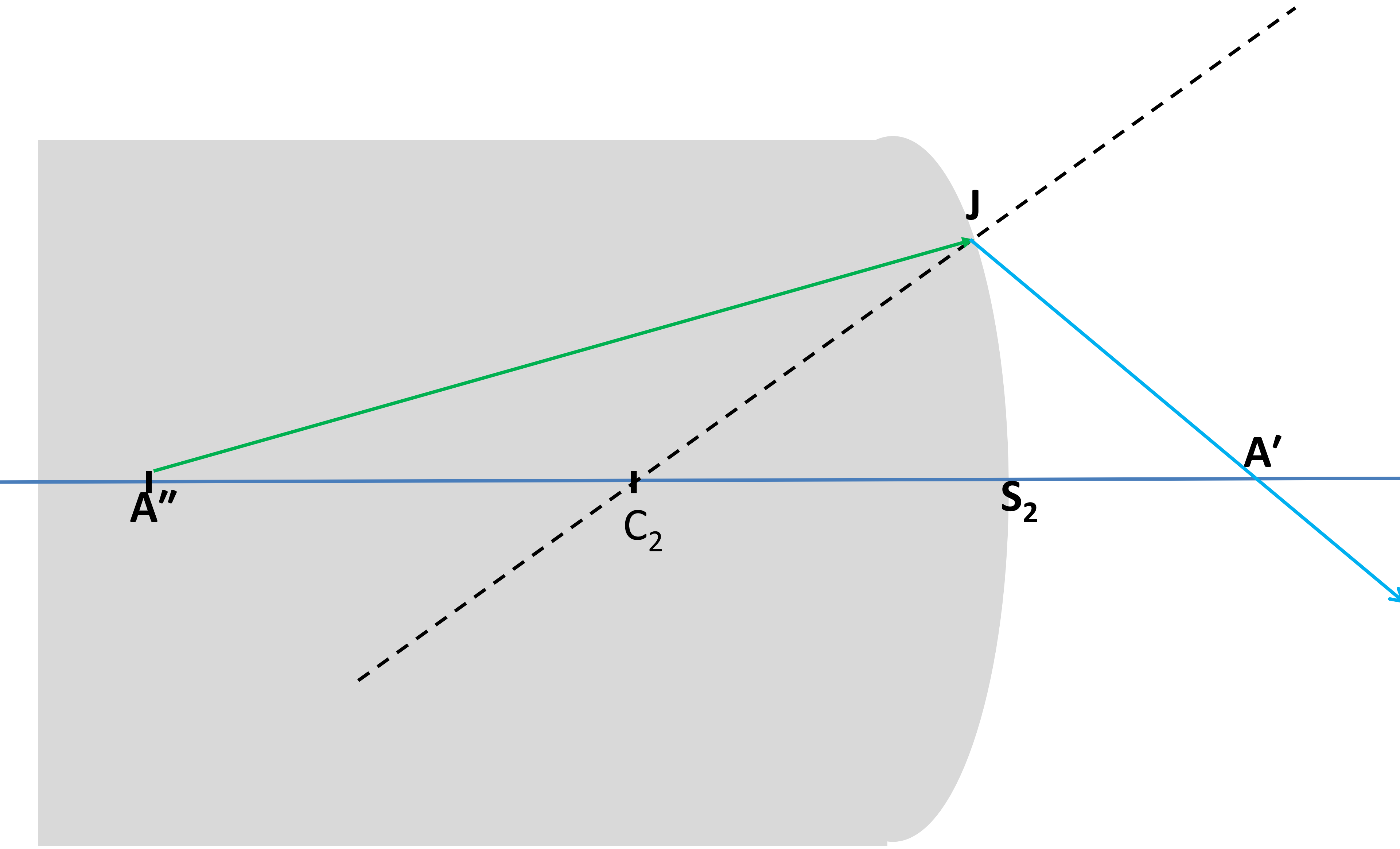
Si p'' et l'abscisse de l'image A''

alors

$$\frac{n}{p''} - \frac{1}{p} = \frac{n-1}{R1} \qquad (1)$$



J
A″
C2
S2

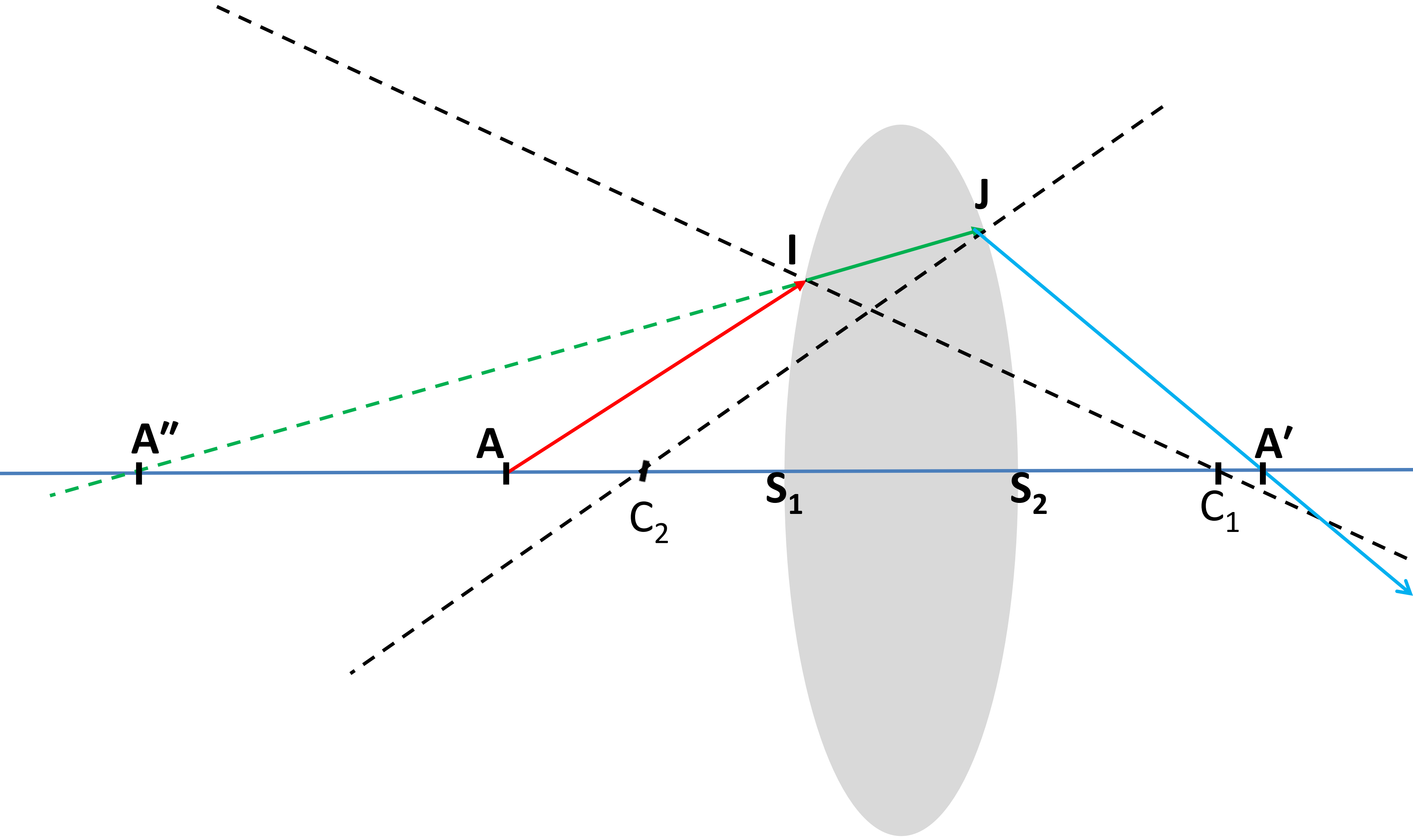

J
A′
A″
C2
S2

Appliquons la relation de conjugaison pour le 2[ième] dioptre

$$\frac{1}{p} - \frac{n}{p''} = \frac{1-n}{R2} \qquad (2)$$

De (1) et (2) on déduit

$$\frac{1}{p'} - \frac{1}{p} = n\left(\frac{1}{R1} - \frac{1}{R2}\right) = \phi$$


J
I
A″
A
A′
C₂
S₁
S₂
C₁

Le foyer objet

$$p = f \ et \ p' \to \infty$$

$$\frac{1}{\infty} - \frac{1}{f} = \phi \quad \Rightarrow \quad f = -\frac{1}{\phi}$$

Le foyer image

$$p' = f' \ et \ p \to \infty$$

$$\frac{1}{f'} - \frac{1}{\infty} = \phi \quad \Rightarrow \quad f' = \frac{1}{\phi}$$

Remarque :

Les foyers F et F sont symétriques par rapport à S

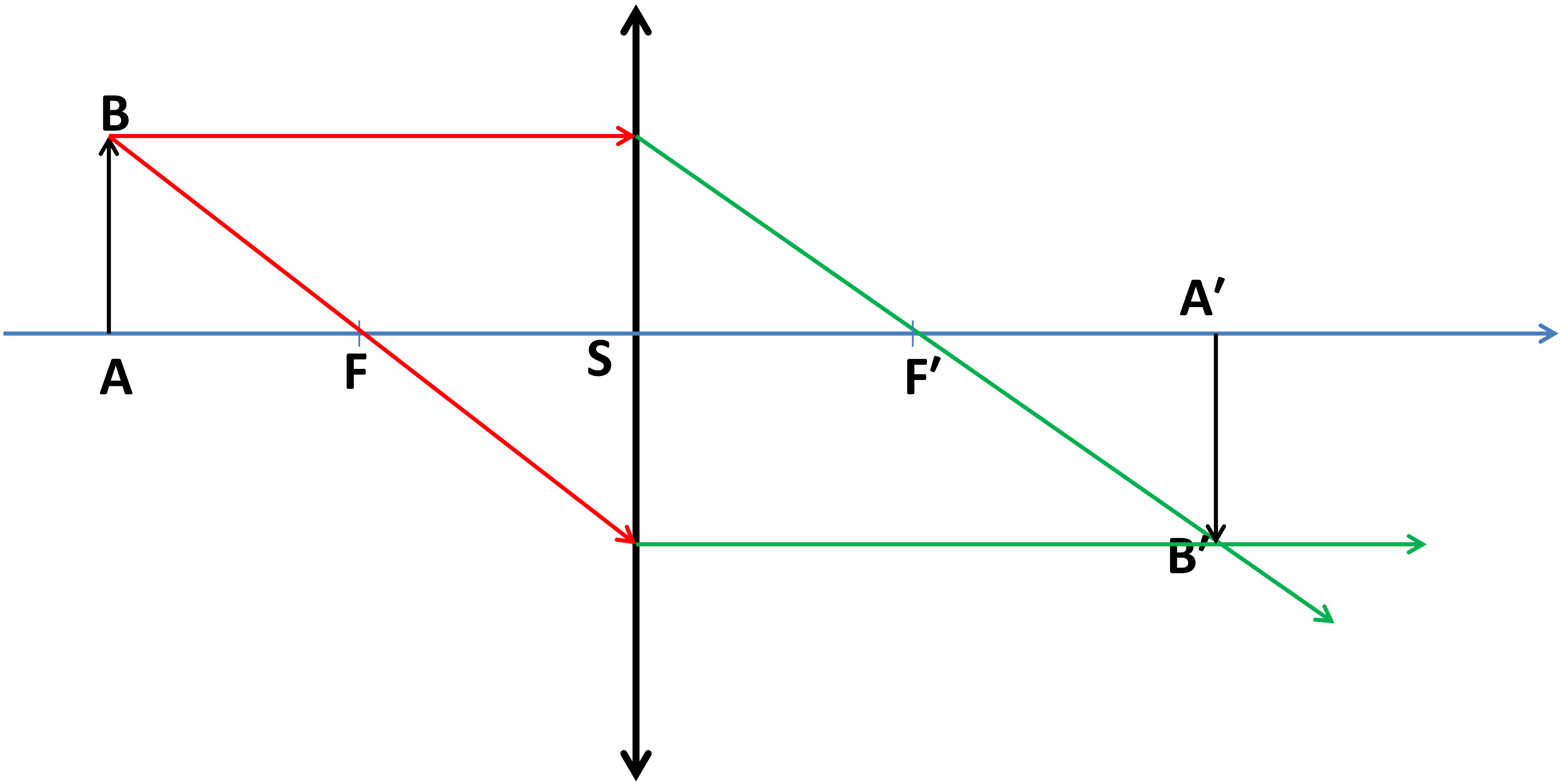
Lentilles covergente

$$\phi > 0, \qquad f^{'} > 0 \quad et \;\; f < 0$$

Lentilles covergente

$$\phi < 0, \qquad f^{'} < 0 \quad et \;\; f > 0$$

Grandissement transversal γ



Par définition on a

$$\gamma = \frac{\overline{A'B'}}{\overline{AB}} = \frac{\overline{FS}}{\overline{FA}} = \frac{\overline{FS}}{\overline{FS}+\overline{SA}} = \frac{-f}{-f+p} \qquad (1)$$

Et o na

$$\frac{1}{p'} - \frac{1}{p} = \frac{1}{f} \quad \Rightarrow \quad f = \frac{pp'}{p-p'}$$

En remplaçant f dans (1) on trouve

$$\gamma = \frac{p'}{p}$$

Grandissement longitudinale g:

$$g = \frac{dp'}{dp}\gamma = \frac{p'^2}{p^2} = \gamma^2$$