Divergent lens: q x p plot and the ray diagram Ch. 24.15

For the divergent case: \( f < 0 \).

We write it as \( f = -\frac{1}{f_H} \).

\[
g = \frac{f}{1 - \frac{f}{p}} = \frac{-\frac{1}{f_H}}{1 + \frac{f}{p}}
\]

Since the denominator does not have 0, the plot is simple we need to choose lens points.

\( p = 2fH, \quad g = \frac{-\frac{1}{f_H}}{1 + \frac{f}{p}} = -\frac{2}{3}fH \)

\( p = fH, \quad g = \frac{-\frac{1}{f_H}}{1 + \frac{f}{p}} = -\frac{1}{2}fH \)

\( p = 0, \quad g = 0 \)

Example of a ray diagram:

For \( p \neq fH \), check \( g = -\frac{2}{3}fH \)

Image: Upright, reduced virtual

We observe the divergent rays.

It is a virtual image. Located at \( \frac{g}{f} = -\frac{2}{3}fH \).
Absorption of momentum: 

As a photon with momentum $p_0$ hits a surface, there are two extreme cases:

1) Pure absorption: 100% of $p_0$ is absorbed and transferred to the surface.

2) Pure reflection: Reflected $= -p_0$

Conservation of momentum leads to $p_0 = P_{abs} + P_{refl}$

$$P_{refl} = \frac{3}{4}p_0$$

We have $T_{abs} = \frac{1}{4} + \frac{3}{4}$ reflection,

Total mom. absorbed by the surface is

$$P_{abs} = \frac{1}{4} \cdot \frac{2p_0}{2} + \frac{3}{4} \cdot 2p_0 = \frac{7}{4}p_0$$