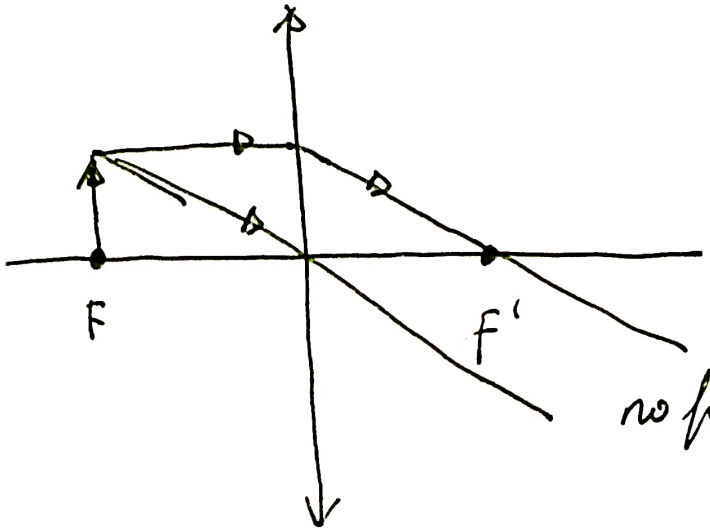
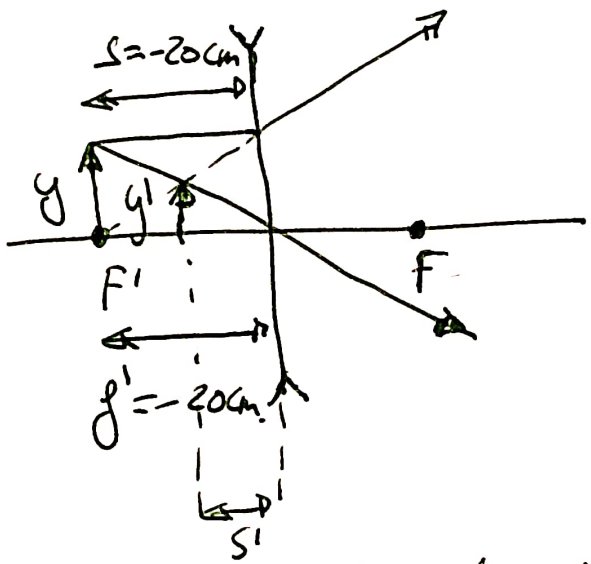
1.-



no forma imaxe

é divergente.



$y = 4\,cm.$

$$\frac{1}{s'} - \frac{1}{s} = \frac{1}{f'} \Rightarrow \frac{1}{s'} = \frac{1}{s} + \frac{1}{f'} \Rightarrow s' = \frac{1}{\frac{1}{s} + \frac{1}{f'}}$$

$$s' = \frac{s \cdot f'}{s + f'} \Rightarrow s' = \frac{(-20cm)(-20cm)}{(-20cm) + (-20cm)} = \frac{400\,cm^2}{-40\,cm} = -10\,cm.$$

$$\frac{y'}{y} = \frac{s'}{s} \Rightarrow y' = y\,\frac{s'}{s} = 4cm\,\frac{(-10cm)}{(-20cm)} = 2\,cm.$$

$$P = \frac{1}{f} = \frac{1}{-0{,}2m} = -5\ Dioptrías$$

2.-

$$\frac{y'}{y} = -\frac{s'}{s} \quad ; \quad \frac{1}{s'} + \frac{1}{s} = \frac{1}{f}$$

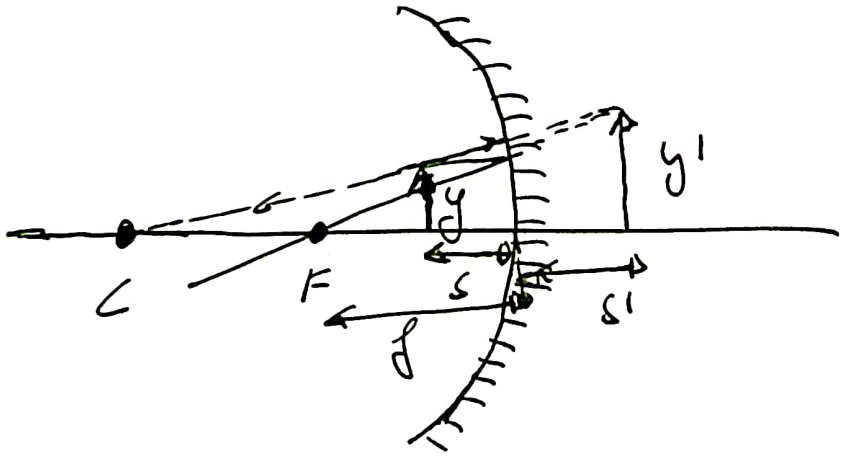
$$\frac{y'}{y} = 1'5 \quad ; \quad s = 20\,cm.$$

$$\frac{y'}{y} = -\frac{s'}{s} \Rightarrow 1'5 = -\frac{s'}{s} \Rightarrow s' = -1'5s$$

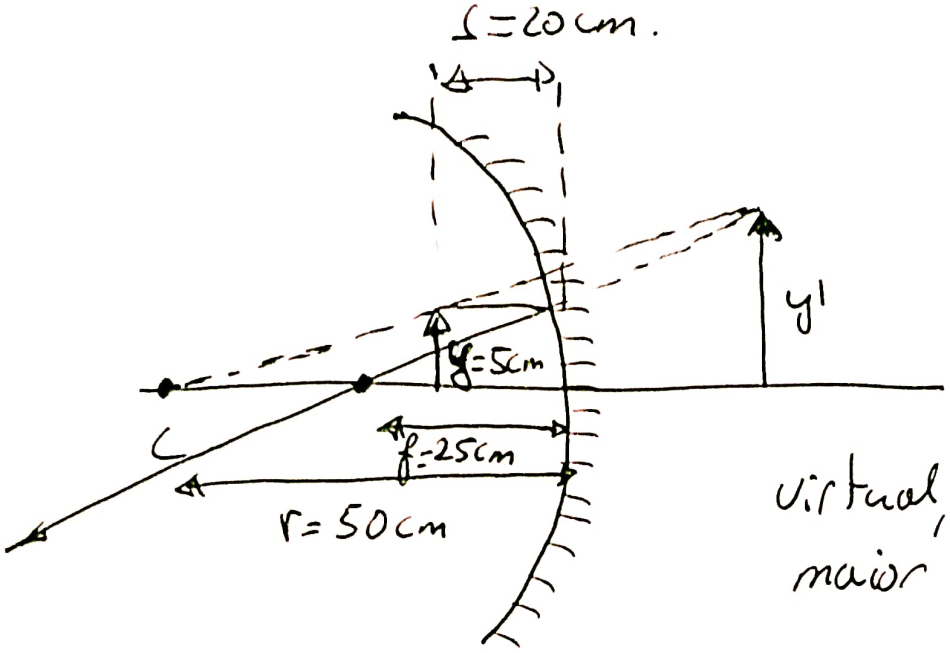
$$\frac{1}{s'} + \frac{1}{s} = \frac{1}{f} \Rightarrow f = \frac{1}{\frac{1}{s'} + \frac{1}{s}} \Rightarrow f = \frac{1}{\frac{s+s'}{s's}}$$

$$f = \frac{s's}{s+s'} \; ; \; f = \frac{(-1'5s)\cdot s}{s-1'5s} = \frac{-1'5\cdot s^2}{0'5s} = -3s$$

$$s = -60\,cm.$$



3.-



virtual, derecha e. maior

$$\frac{1}{s'} + \frac{1}{s} = \frac{1}{f} \Rightarrow \frac{1}{s'} = \frac{1}{f} - \frac{1}{s}$$

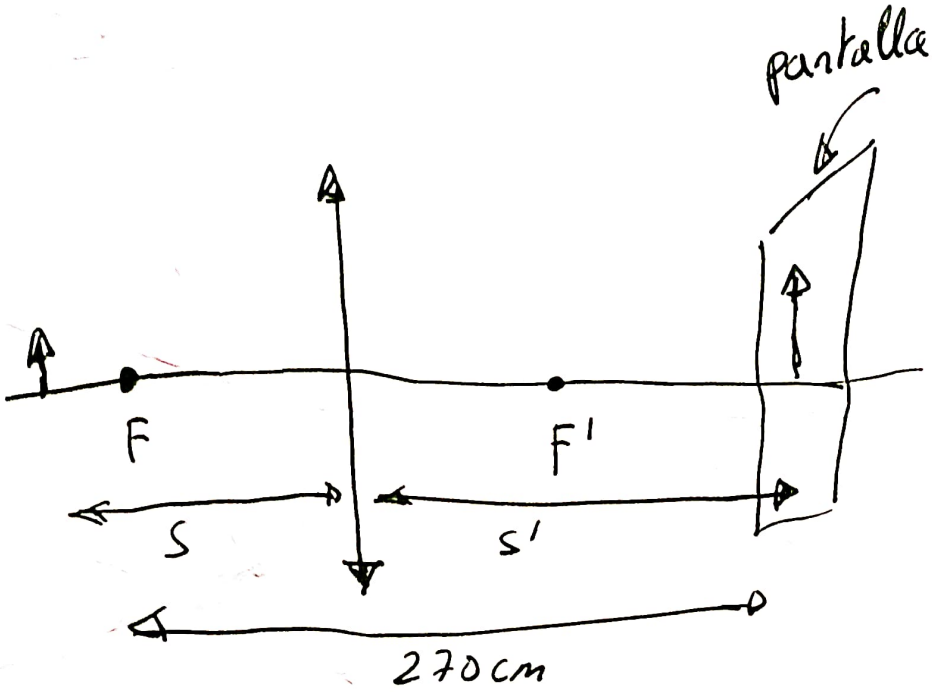
$$\frac{1}{s'} = \frac{s-f}{s \cdot f} \Rightarrow s' = \frac{s \cdot f}{s-f} = \frac{(-20cm).(-25cm)}{-20cm+25cm} =$$

$$-20cm-(-25cm)$$

$$= \frac{500\,cm^2}{5cm} = 100cm$$

$$\frac{y'}{y} = -\frac{s'}{s} \Rightarrow y' = -y\,\frac{s'}{s} = -5cm\,\frac{100cm}{-20cm} = 25cm$$

4.-



$s + s' = 270\ cm.$

$\frac{y'}{y} = 10 \Rightarrow y' = 10y \quad ; \quad \frac{y'}{y} = \frac{s'}{s}$

$s' = 10s$

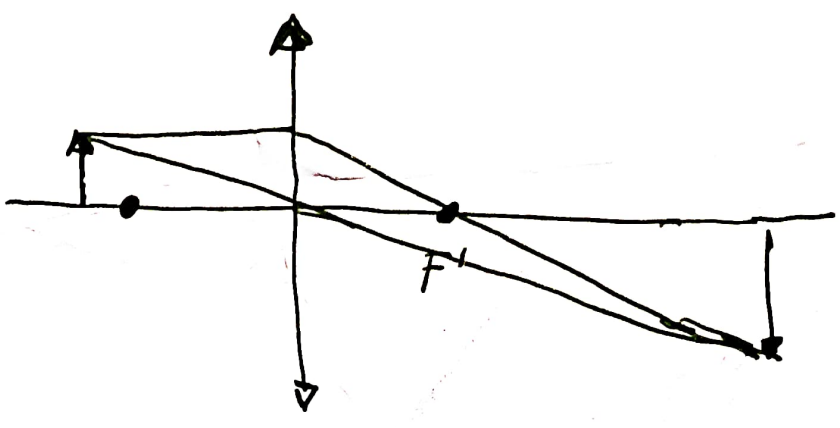
$s + 10s = 270\ cm \Rightarrow s = \frac{270\ cm.}{11} = 24'55\ cm$

$s' = 245'5\ cm$

$\frac{1}{s'} - \frac{1}{s} = \frac{1}{f'} \Rightarrow f' = \frac{s' \cdot s}{s - s'}$

$f' = \frac{(-245'5\ cm)(24'55\ cm)}{(-24'55\ cm) - 245'5\ cm} = +22'31$

$P = \frac{f}{0'2231\ m} = 4'48\ dioptrías$

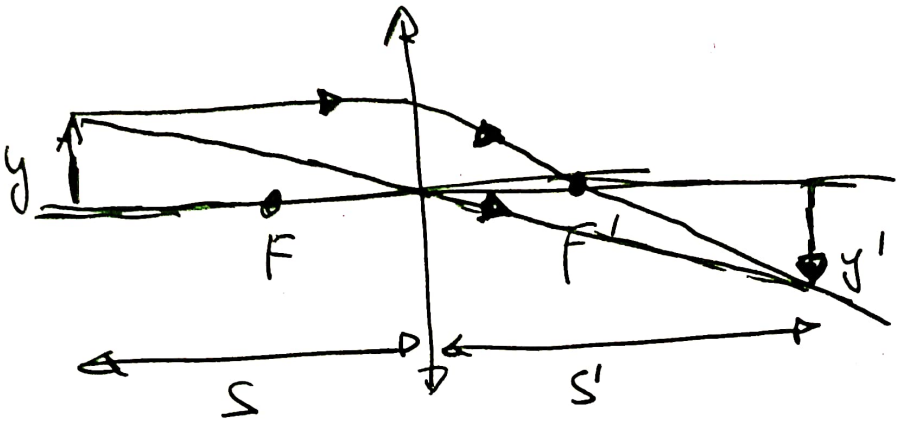


5.- $y = 3\,cm.$

$s = 20cm$

$f' = 10cm.$

a)



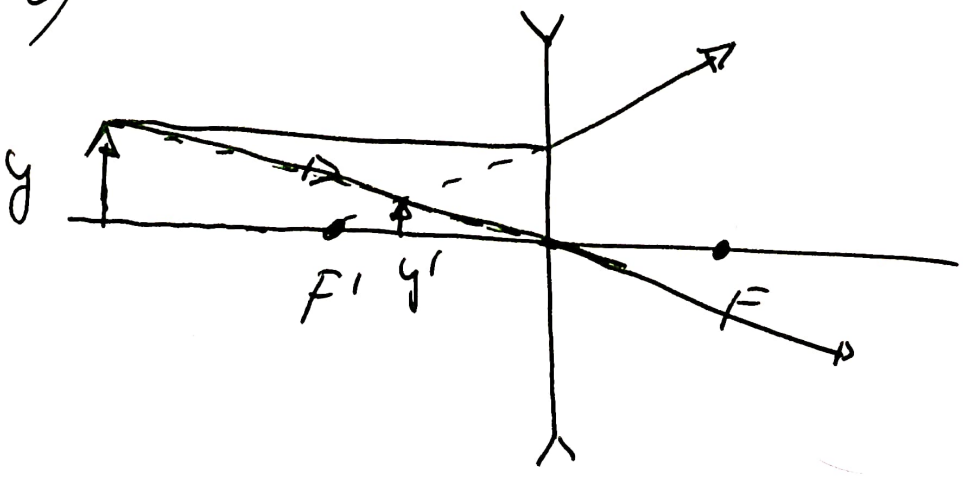
$$\frac{1}{s'} - \frac{1}{s} = \frac{1}{f'} \Rightarrow \frac{1}{s'} = \frac{1}{f'} + \frac{1}{s} \;;\; \frac{1}{s'} = \frac{s+f'}{f' \cdot s}$$

$$s' = \frac{f' \cdot s}{s+f'} \Rightarrow s' = \frac{10cm(-20cm)}{10cm - 20cm} = \frac{-200\,cm^2}{-10cm} = 20cm$$

$$\frac{y'}{y} = \frac{s'}{s} \Rightarrow y' = y\left(\frac{s'}{s}\right)$$

$$y' = 3cm\left(\frac{-20cm}{20cm}\right) = -3cm.$$

b)



5. (CONTINUACIÓN)

$$\frac{1}{s'} - \frac{1}{s} = \frac{1}{f'} \Rightarrow \frac{1}{s'} = \frac{1}{f'} + \frac{1}{s}$$

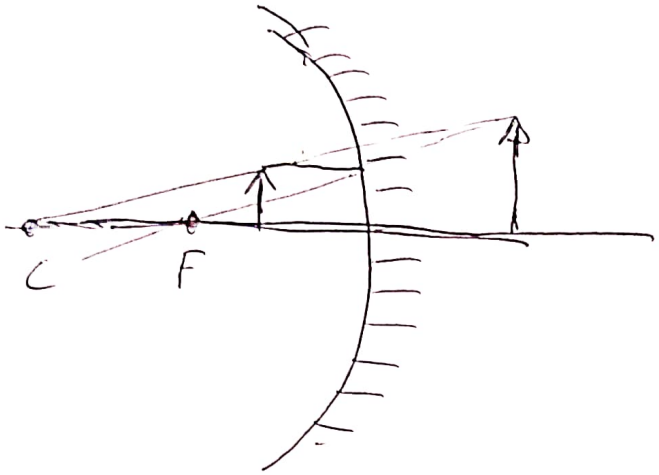
$$\frac{1}{s'} = \frac{s + f'}{s \cdot f'} \Rightarrow s' = \frac{(-20\,cm)(-10\,cm)}{-20\,cm + (-10\,cm)} =$$

$$= \frac{200\,cm^2}{-30\,cm} = -6'67\,cm.$$

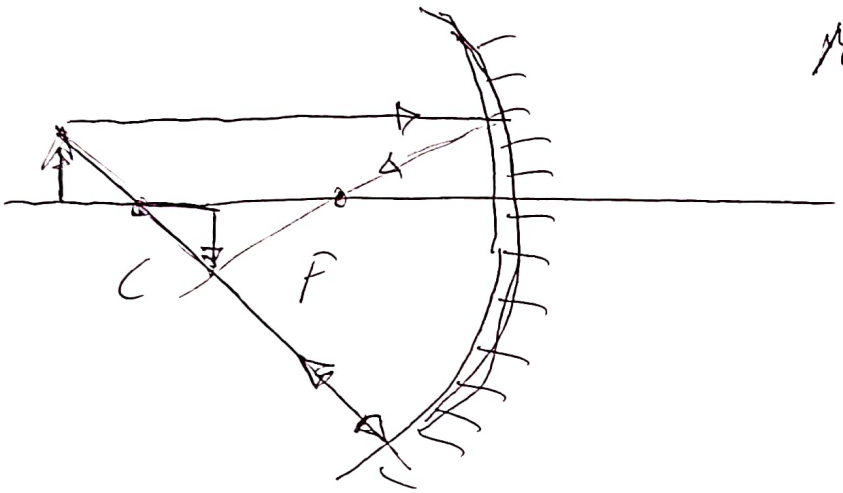
$$\frac{y'}{y} = \frac{s'}{s} \Rightarrow y' = y\,\frac{s'}{s}$$

$$y' = 3\,cm\ \frac{(-6'67\,cm)}{(-20\,cm)} = 1\,cm.$$

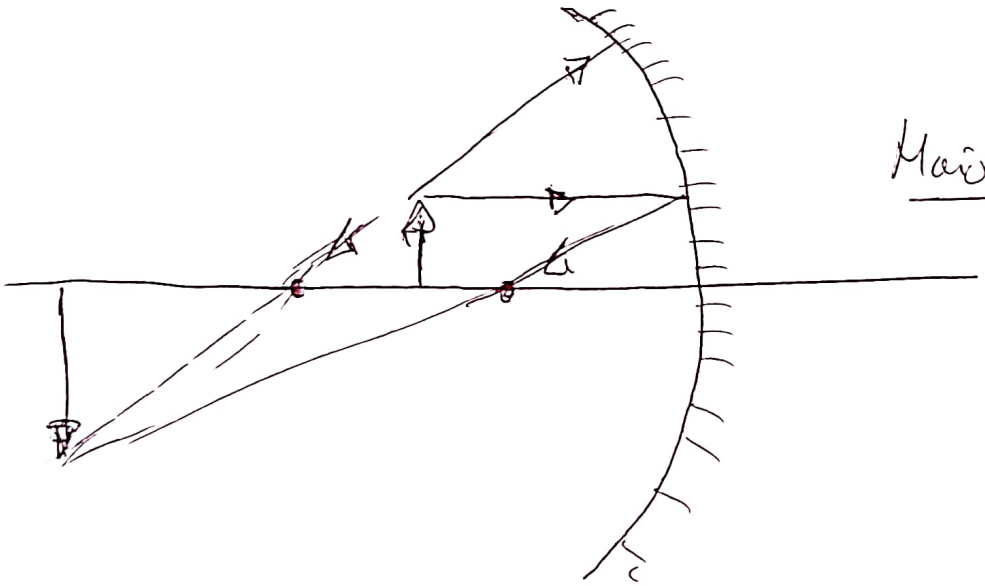
6.-



Non real.



Menor.



Maior e real.

$y = 3'5\,cm.$

$r = R = 15\,cm \quad ; \quad r = -15\,cm \Rightarrow f = -7'5\,cm.$

$$\frac{1}{s'} + \frac{1}{s} = \frac{1}{f} \quad ; \quad \frac{y'}{y} = -\frac{s'}{s}$$

$$s' = 2s$$

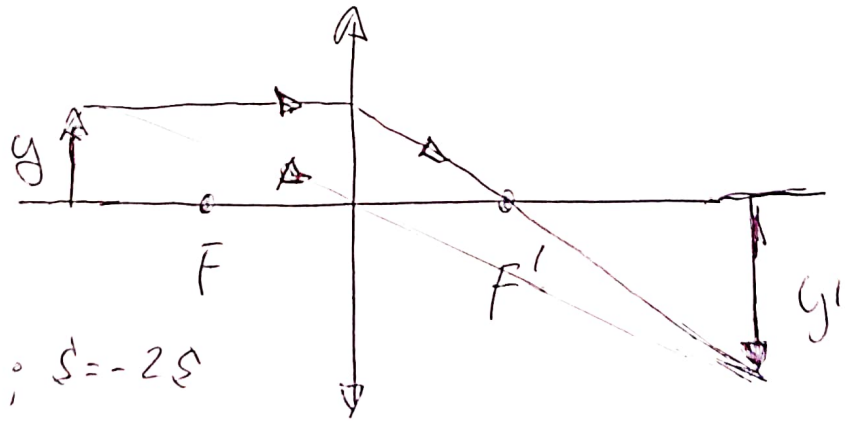
$$\frac{s+s'}{s'\cdot s} = \frac{1}{f} \Rightarrow f = \frac{s'\cdot s}{s+s'} \Rightarrow f = \frac{2s\cdot s}{s+2s} = \frac{2s^2}{3s}$$

$$f = \frac{2}{3}s \Rightarrow s = \frac{3}{2}\cdot f$$

$$s = 1'5(-7'5\,cm) = -11'25\,cm.$$

$$y' = -y\frac{s'}{s} = -1'5\,cm\ \frac{2\times(-11'25cm)}{-11'25cm} = -3\,cm.$$

b) a distancia focal da lente convexente vai ser do mesmo valor que a do espello pero positiva

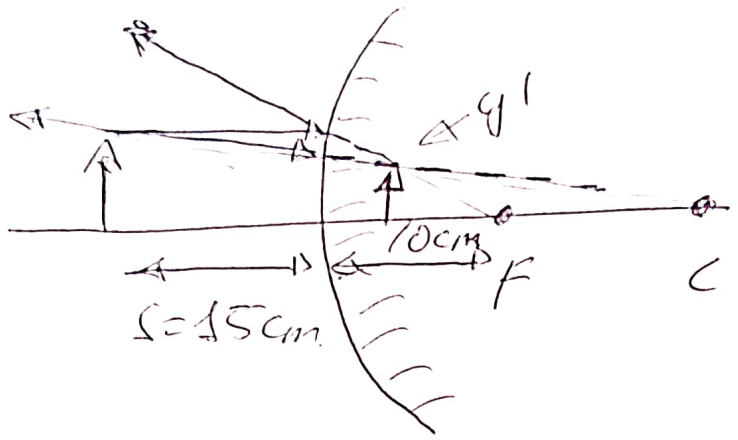


$$\frac{1}{s'} - \frac{1}{s} = \frac{1}{f'} \quad ; \quad s' = -2s$$

$$\frac{1}{-2s} - \frac{1}{s} = \frac{1}{f'} \Rightarrow -\frac{3}{2s} = \frac{1}{f'} \Rightarrow s = -\frac{3}{2}f'$$

$$s = -1'5\cdot f' \Rightarrow s = -11'25\,cm.$$

7.- $y = 1'5\,cm$



$$\frac{1}{s'} + \frac{1}{s} = \frac{1}{f} \quad ; \quad \frac{y'}{y} = -\frac{s'}{s}$$

$$\frac{s+s'}{s'\cdot s} = \frac{1}{f} \Rightarrow // \quad \frac{1}{s'} = \frac{1}{f} - \frac{1}{s}$$

$$\frac{1}{s'} = \frac{s-f}{f\cdot s} \Rightarrow s' = \frac{f\cdot s}{s-f} = \frac{(10cm)\cdot(-15cm)}{(-15cm)-10cm}$$

$$s' = \frac{-150cm^2}{-25cm} = +6\,cm$$

$$y' = -y\,\frac{s'}{s} = -1'5cm\,\frac{(6cm)}{(-15cm)} = +0'6\,cm$$

Non compte son virtuals

8.- O mesmo que o 7.

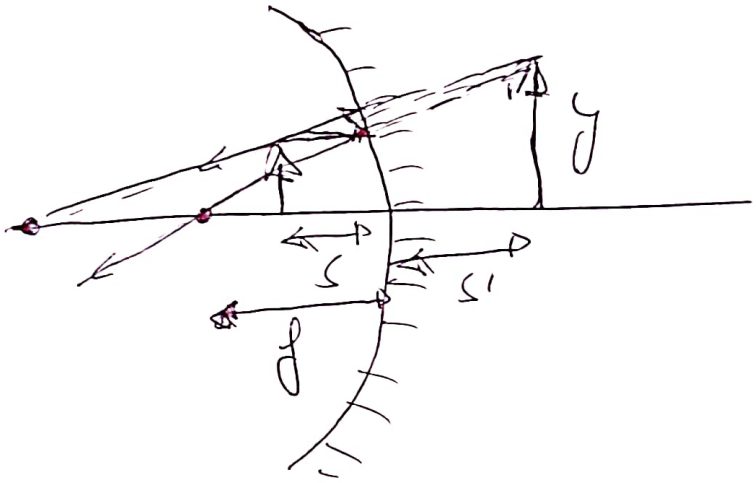
9.-

Espello concavo

$y = 3\,cm.$

$s = 8\,cm.$

$s' = 10\,cm.$ a <u>dereita</u> do espello



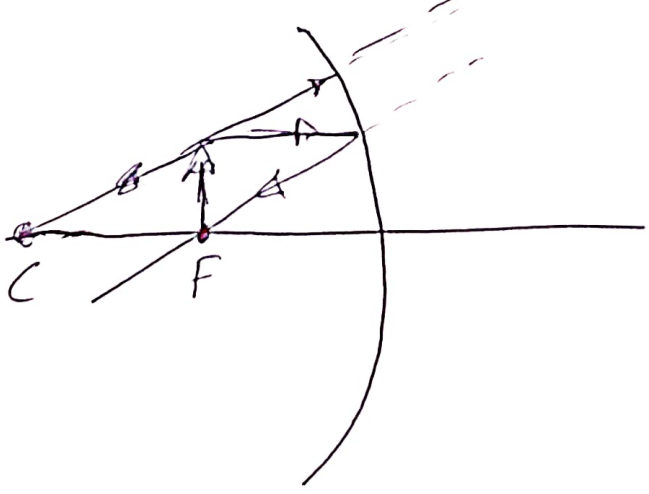
$$\frac{1}{s'} + \frac{1}{s} = \frac{1}{f'} \qquad \frac{y'}{y} = -\frac{s'}{s}$$

$$f' = \frac{g+s'}{} \quad \text{ou} \quad f' = \frac{s' \cdot s}{s+s'} = \frac{(10\,cm)(-8\,cm)}{10\,cm - 8\,cm} = \frac{-80\,cm^2}{2\,cm}$$

$$f' = -40\,cm.$$

$$y' = -y\frac{s'}{s} = -3\,cm.\ \frac{10\,cm}{(-8\,cm)} = +3'75\,cm.$$

c)

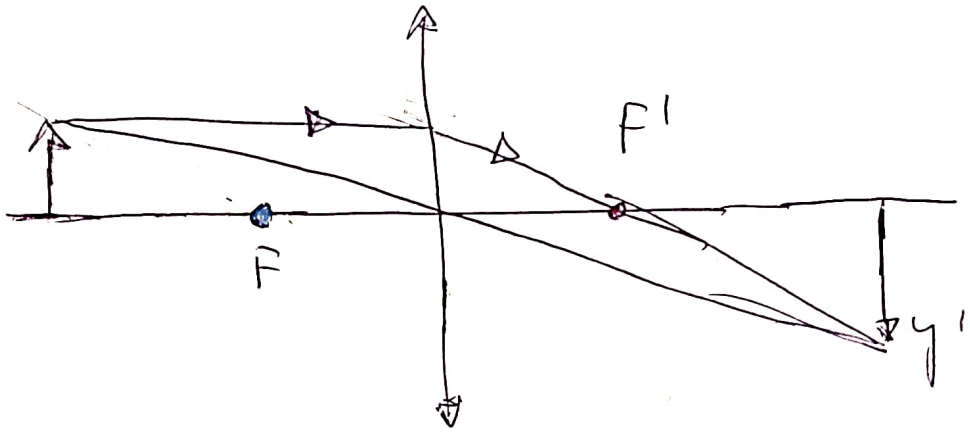


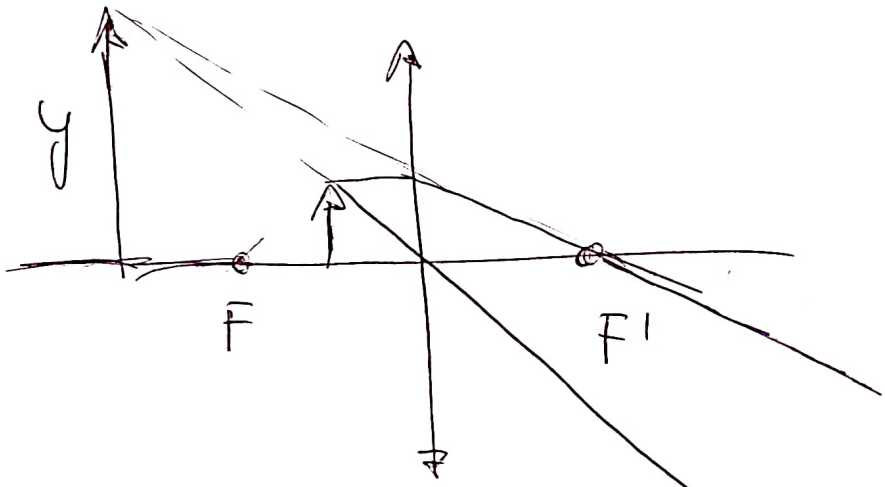
NO FOCO

5o.- $y = 3cm$

$s = 75cm$

$s' = +37'5cm$





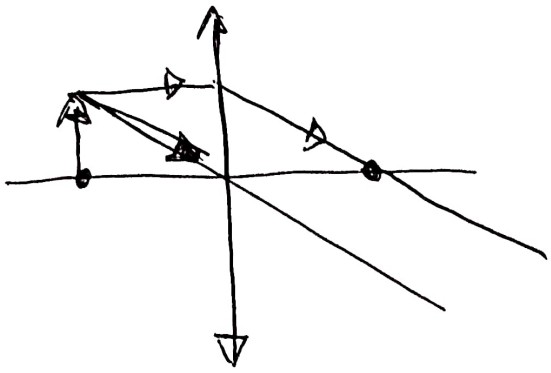
por detras do foco debe estar o obxecto.

$$\frac{1}{s'} - \frac{1}{s} = \frac{1}{f'} \Rightarrow \frac{s - s'}{s \cdot s'} = \frac{1}{f'} \Rightarrow f' = \frac{s \cdot s'}{s - s'}$$

$$f' = \frac{(-75cm) \cdot (37'5cm)}{-75cm - 37'5cm} = 25'0\ cm.$$

$$y' = y \frac{s'}{s} \Rightarrow y' = 3cm \cdot \frac{37'5cm}{-75cm} = -1'5cm.$$

c)



líñas paralelas

Analíticamente

$$\frac{1}{s'} - \frac{1}{s} = \frac{1}{f'} = 0 \quad s' = \frac{s \cdot f'}{s + f'} \Bigg\} \; s' = \frac{s \cdot f'}{0} = \infty$$

$\downarrow$

$s = -f'$

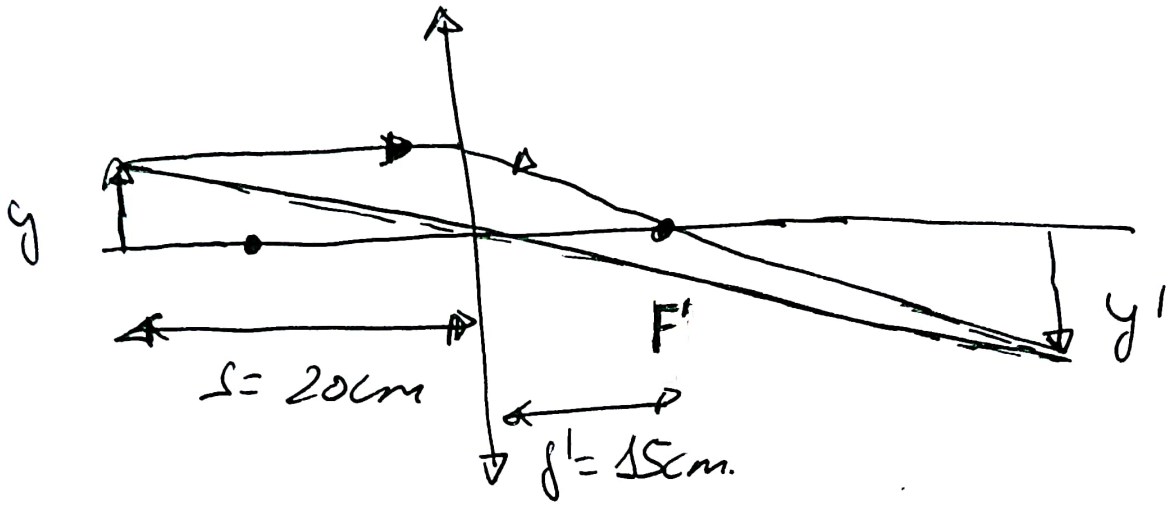
15. –

$y = 3\,cm.$

$s = 20\,cm$

$f = 15\,cm$

a)



REAL, INVERTIDA, MAIOR

$$\frac{1}{s'} - \frac{1}{s} = \frac{1}{f'} \qquad \frac{y'}{y} = -\frac{s'}{s}$$

$s = -20\,cm$

$f' = 15\,cm$

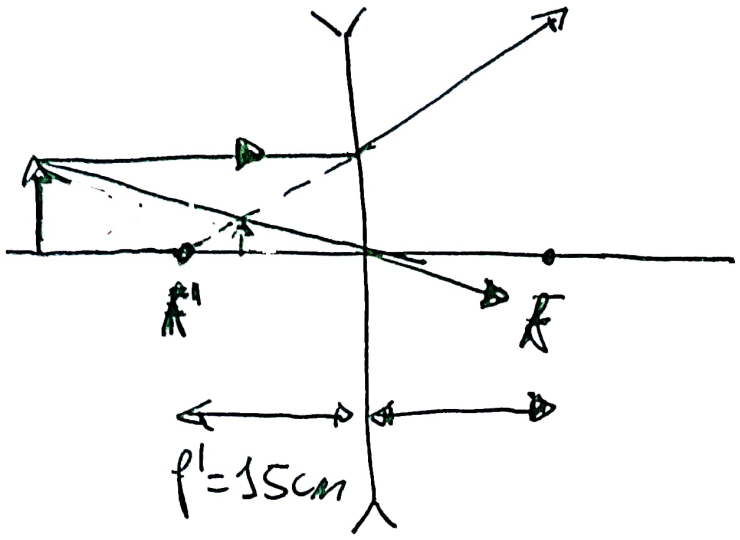
$$\frac{1}{s'} - \frac{1}{s} = \frac{1}{f'} \Rightarrow \frac{1}{s'} = \frac{1}{f'} + \frac{1}{s} \; ; \; \frac{1}{s'} = \frac{s+f'}{s.f'}$$

$$s' = \frac{s\,f'}{s+f} = \frac{(-20\,cm)(15\,cm)}{-20\,cm+15\,cm} = \frac{-300\,cm^2}{-5\,cm} = 60\,cm.$$

$s' = +60\,cm$

$$y' = -y\,\frac{s'}{s} = 2\,cm\,\frac{60\,cm}{-20\,cm} = -9\,cm.$$

b)



IMAXE, VIRTUAL DEREITA E MENOR.

$$\frac{1}{s'} - \frac{1}{s} = \frac{1}{f'} \qquad \frac{y'}{y} = \frac{s'}{s}$$

$f' = -15\,cm.$

$s = -20\,cm.$

$$s' = \frac{s \cdot f'}{s+f} = \frac{(-20\,cm)(-15cm)}{(-20\,cm)+(-15cm)} = \frac{300\,cm^2}{-35cm} = -8'6\,cm.$$

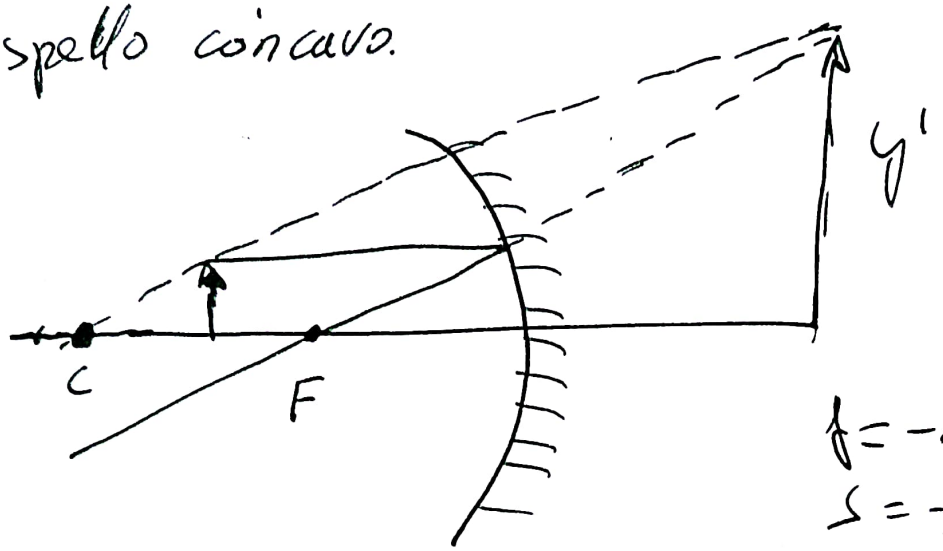
$$y' = y\,\frac{s'}{s} = 3\,cm\ \ \frac{-8'6\,cm}{-20\,cm} = 1'29\,cm.$$

12.- $r = 50\,cm.$

$y = 5\,cm.$

$s = 30\,cm.$

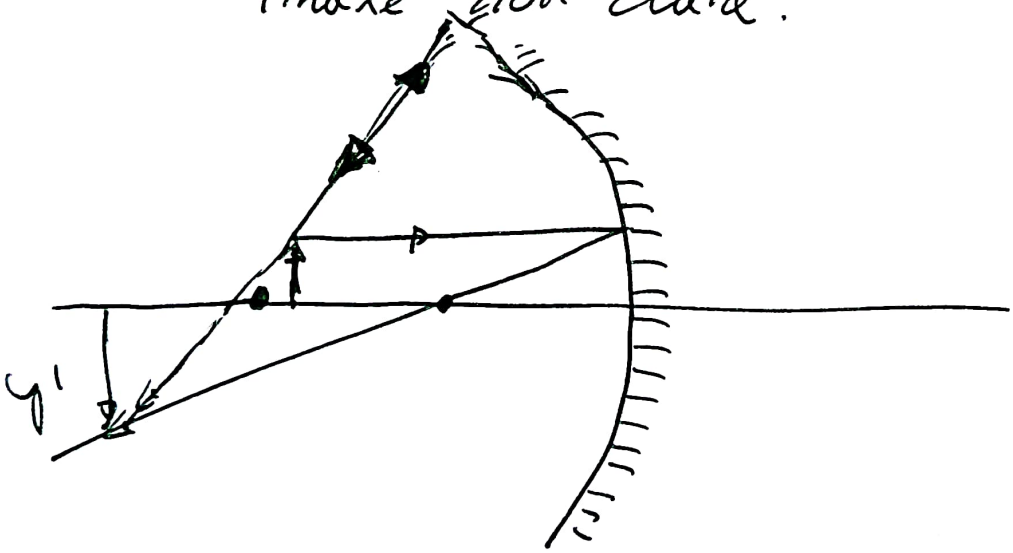
a) espello cóncavo.



$f = -25\,cm.$

$s = -30\,cm.$

imaxe non clara!



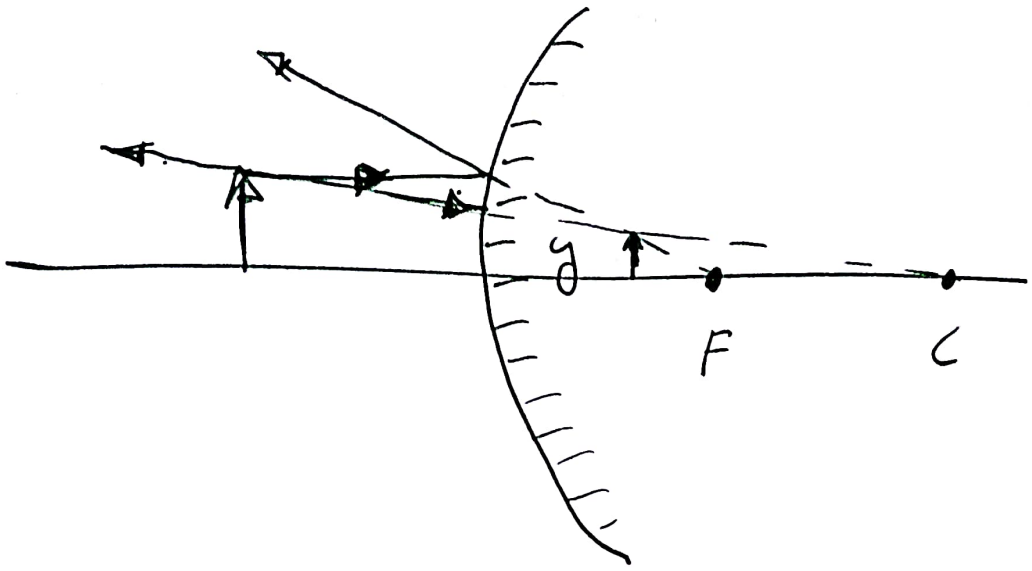
non moito máis clara

$$\frac{1}{s'} + \frac{1}{s} = \frac{1}{f} \Rightarrow \frac{1}{s'} = \frac{1}{f} - \frac{1}{s} \Rightarrow \frac{1}{s'} = \frac{s-f}{f \cdot s}$$

$$s' = \frac{f \cdot s}{s-f} = \frac{-25(-30cm)}{(-30cm)-(-25cm)} = \frac{750\,cm^2}{-5\,cm} = -150\,cm.$$

$$y' = -y\,\frac{s'}{s} \Rightarrow y = -5cm.\,\frac{(-150cm)}{(-30cm.)} = -25cm.$$

B)



$$s' = \frac{f \cdot s}{s - f}$$

$r = 50\,cm$

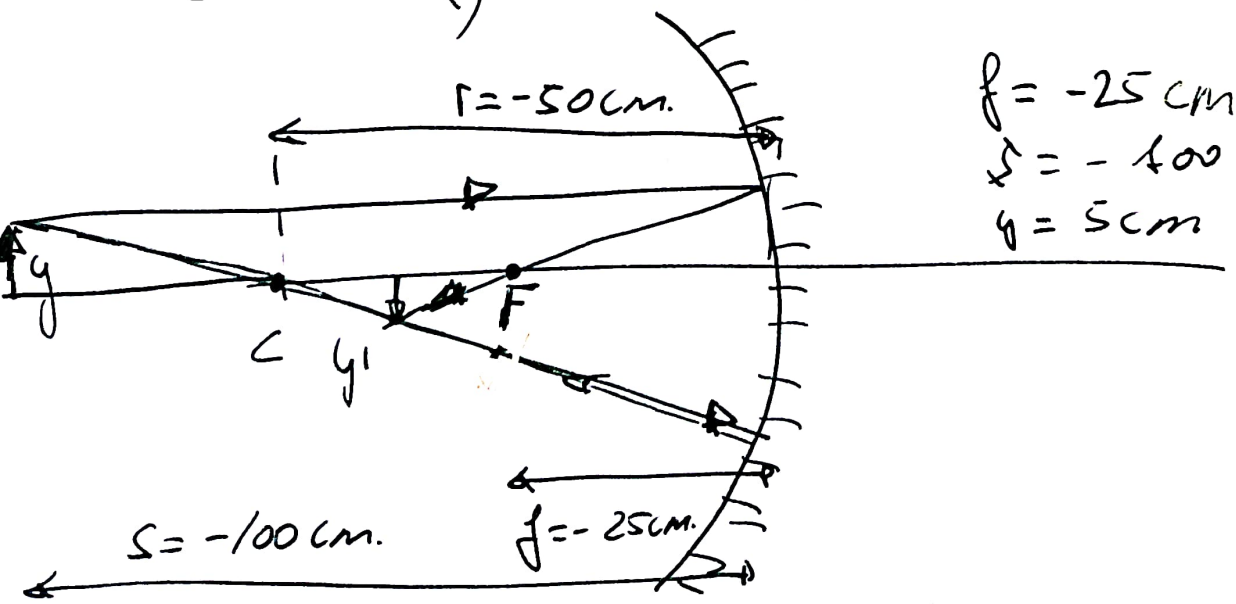
$f = 25\,cm.$

$s = -30\,cm$

$$s' = \frac{(25\,cm)(-30\,cm)}{-30\,cm - 25\,cm} = \frac{-750\,cm^2}{-55\,cm} = 13'6\,cm.$$

$$y' = -y\,\frac{s'}{s} = -5\,cm.\,\frac{13'6\,cm}{-30\,cm} = +2'27\,cm.$$

13.- a)



$f = -25\,cm$

$s = -100\,cm.$

$y = 5\,cm$

IMAXE, MENOR, INVERTIDA REAL

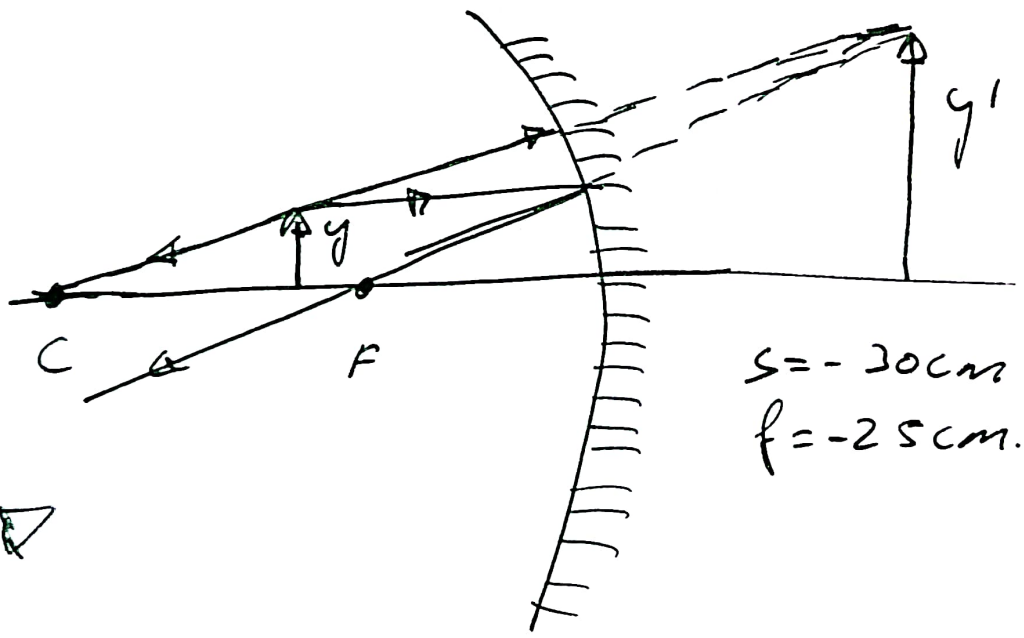
$$\frac{1}{s'} + \frac{1}{s} = \frac{1}{f} \quad ; \quad \frac{y'}{y} = -\frac{s'}{s}$$

$$\frac{1}{s'} = \frac{1}{f} - \frac{1}{s} \Rightarrow \frac{1}{s'} = \frac{s-f}{f \cdot s} \Rightarrow s' = \frac{f \cdot s}{s-f}$$

$$s' = \frac{(-25\,cm)(-100\,cm)}{(100\,cm) - (-25\,cm)} = \frac{2500\,cm^2}{-75\,cm} = -33'3\,cm.$$

$$y' = -y\,\frac{s'}{s} = -\frac{5\,cm.(-33'3\,cm)}{(-100\,cm.)} = 0'17\,cm.$$

6)



$s = -30\,cm$

$f = -25\,cm.$

"parece" que pode ser imaxe maior virtual e dereita

$$s' = \frac{f \cdot s}{s-f} = \frac{(-25cm)(-30\,cm)}{(-30cm) - (-25cm)} = \frac{750\,cm^2}{-5\,cm} = -150\,cm.$$

IMAXE ERRONEA

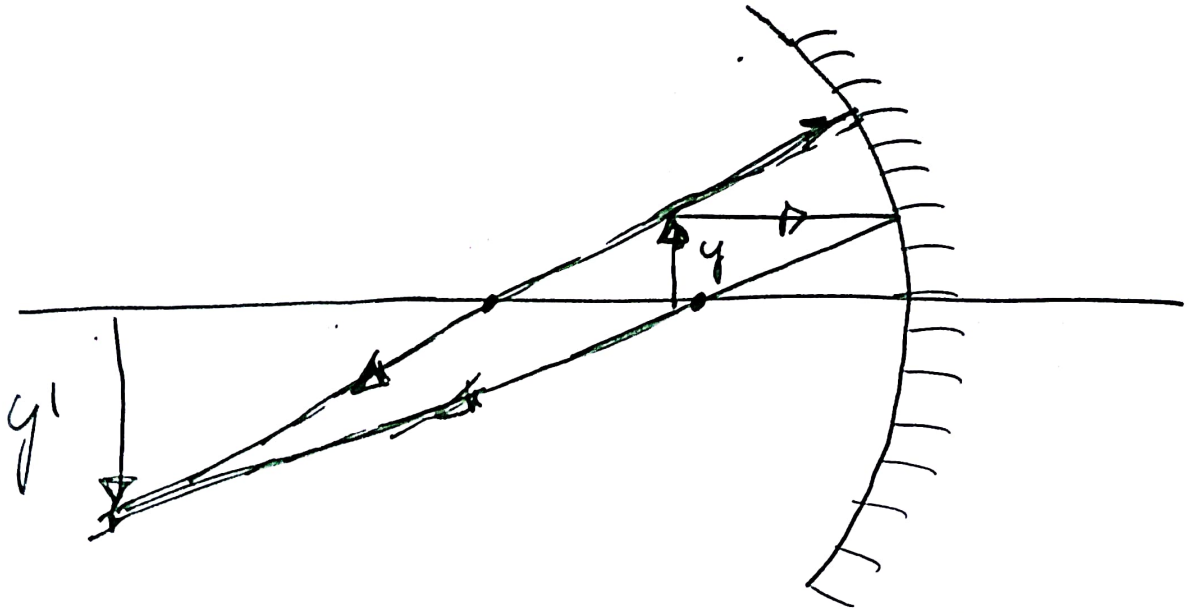


imagem invertida, menor, e real.

$$y' = -y\frac{s'}{s} = -\frac{5\,cm.(-150\,cm)}{-30\,cm} = -25\,cm.$$

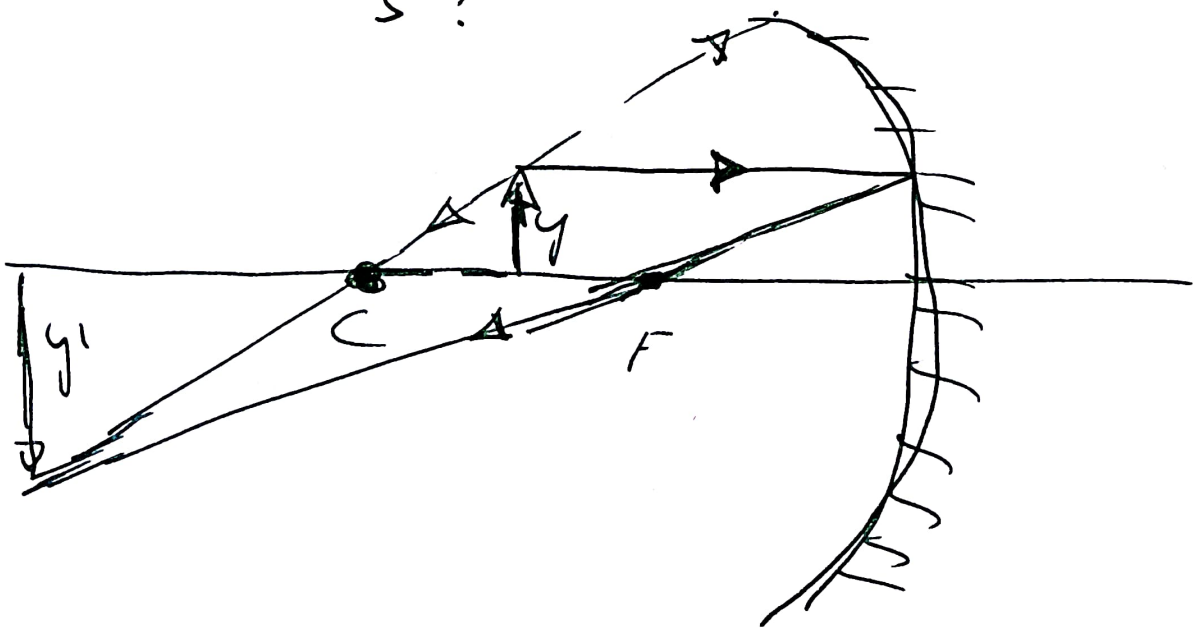
14.-

a) $s = -75\,cm.$

$y = 5\,cm.$

$R = 100\,cm \Rightarrow f = -50\,cm.$

s' ?



$$\frac{1}{s'} + \frac{1}{s} = \frac{1}{f} \Rightarrow \frac{1}{s'} = \frac{1}{f} - \frac{1}{s} \; ; \; \frac{1}{s'} = \frac{s-f}{s.f}$$

$$s' = \frac{s.f.}{s-f} \; ; \; s' = \frac{(-75cm)(-50cm)}{(-75cm)-(-50cm)} =$$

$$s' = \frac{3750\ cm^2}{-25cm} = -150\ cm$$

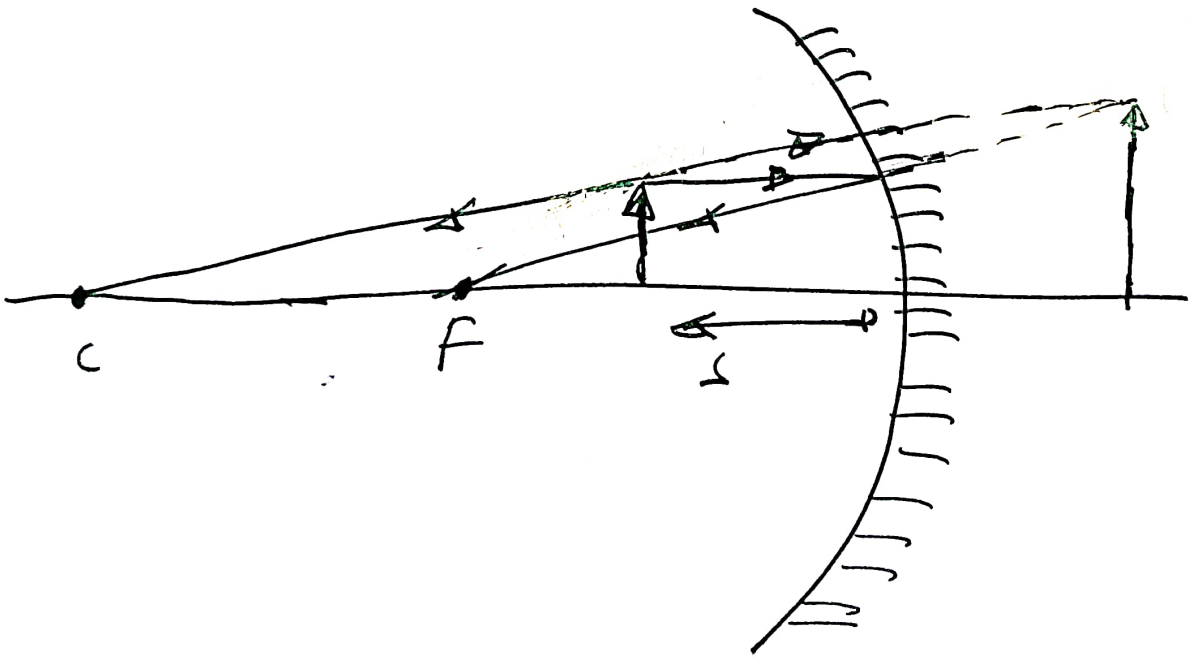
$$y' = -y\,\frac{s'}{s} = -5cm.\,\frac{(-150cm)}{-75cm} = -10cm.$$

6)

$s = -25cm.$

$y = 5cm.$

$f = -50cm.$



$$s' = \frac{s \cdot f}{s - f} = \frac{(-25cm)\cdot(-50cm)}{(-25cm)-(-50cm)} = \frac{1250\,cm^2}{25\,cm}$$

$s' = 50cm$

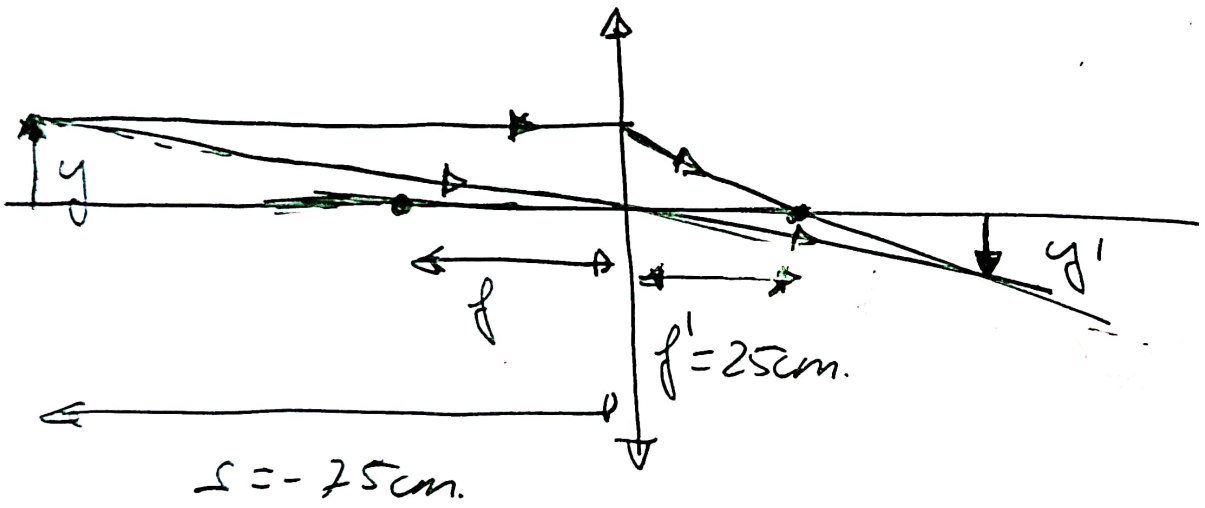
$$y' = -y\,\frac{s'}{s} = -5cm \cdot \frac{50cm}{-25cm} = 10cm.$$

15.-

$y = 3\,cm.$

$s = -75cm.$

$f' = +25cm$ (convexente)



Real invertida, menor

$$\frac{1}{s'} - \frac{1}{s} = \frac{1}{f'} \quad ; \quad \frac{1}{s'} = \frac{1}{f'} + \frac{1}{s}$$

$$\frac{1}{s'} = \frac{s + f'}{f' \cdot s} \Rightarrow s' = \frac{f' \cdot s}{s + f}$$

$$s' = \frac{(25cm.)(-75cm)}{25cm - 75cm} = 37'5\,cm.$$

$$y' = y\,\frac{s'}{s} = 3\,cm.\,\frac{17'5\,cm.}{-75\,cm} = -1'5\,cm$$

16.-

Virtual, derecha e doble de tamaño

$s = 10\,cm.$

$$\frac{y'}{y} = -\frac{s'}{s} \Rightarrow \frac{s'}{s} = -2 \Rightarrow s' = -2s$$

$$\frac{1}{-2s} + \frac{1}{s} = \frac{1}{f} \Rightarrow \frac{1}{2s} = \frac{1}{f}.$$

$$f = 2s \Rightarrow f = 2(-10\,cm) = -20\,cm.$$

$$s' = -2s \Rightarrow s' = -2(-10\,cm) = 20\,cm.$$