$/f=1/f^{-}=-2/r$ --------- (71

Substitute eq.7 in eq 4 we obtain:

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

--------(8

Just for lenses

$m=y^{-}/y=-s^{-}/s$

$p=1/f$, $v=1/s$, $v^{-}=1/s^{-}$

$v+v^{-}=p=-2k$

$p=-2k$

$m=y^{-}/y=-v/v$

Ex: An object is situated 10cm in front of a concave mirror of

radius 16cm . find:a- the focal length of the mirror, b-image position,

c- lateral magnification.

Sol.

a-$f=-\frac{r}{2}$

$f=-(-16)/2=8cm$

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

$1/10+1/s^{-}=1/8$

$1/s^{-}=1/8-1/10=1/40$

$s^{-}=40cm$

c- $m=-s^{-}/s=-40/10=-4$

the image formed at 40cm to the left of the mirror , is four times the size of the object and it is real and inverted.

EX: Ex: An object is situated 20cm in front of a conves mirror of radius 50cm . find:a- the power of the mirror, b-image position, c- lateral magnification.

Sol.

a-k=1 /r = 1/ 0.5 = + 2D

V= 1/S= 1/0.2 =5D

P= -2K = -2*2=-4 D

b- $v+v^{-}=p$

$5+v^{-}=-4$

$v^{-}=-9D$

$S^{-}= 1/V^{-}= - (1/9)= - 11.1cm$

$m= - s^{-} / s = - v/v^{-}= - 5 / -9 = 0.555$

the image isvirtual and erect and locatedat 11.1 cm to theright of the mirror ,and it has magnification 0.555(smaller in size)

Ex: An object is placed at 10cm to the left of the diverging lens(f=-5cm) ,a concave mirror (R=20cm) is placed 20cm to the right of the lens

Calculate the location of the final image with respect to the lens

Sol.

S=10cm,f=-5cm

R=20cm

1-through the lens: $1/s + 1/s^{-} = 1/f$

$1/10 + 1/s^{-} = 1/-5 \rightarrow S_1^{-} = -3.33cm$

2-through the mirror:

$f_2 = -R/2 = -20/2 = 10cm$

$s_2 = 3.33 + 20 = 23.33cm$

3-the lens: $1/S_2 + 1/S_2^{-} = 1/f_2$

$1/23.33 + 1/s_2^{-} = 1/10$

$S_2^{-} = 17.5cm$

4-through the lens:

20-17.5=2.5cm

$1/2.5 + 1/S_3^{-} = 1/-5$

$S_3^{-} = -1.67cm$