Ch. 34: Mirrors, Refracting Surfaces, and Lenses

**Refracting Surface**

\[
\frac{n_a}{s} + \frac{n_b}{s'} = \frac{n_b - n_a}{R}
\]

\[
m = \frac{y'}{y} = -\frac{n_a s'}{n_b s}
\]

Flat surface: \( R = \text{infinity} \)

\[
\frac{s'}{s} = -\frac{n_b}{n_a} \quad m = +1
\]

**Mirrors and Lenses**

\[
\frac{1}{s} + \frac{1}{s'} = \frac{1}{f}
\]

\[
m = \frac{y'}{y} = -\frac{s'}{s}
\]

Mirror: \( f = \frac{R}{2} \)

Thin lens in air or vacuum: \( \frac{1}{f} = (n - 1) \left( \frac{1}{R_1} - \frac{1}{R_2} \right) \)

**Mirrors, Refracting Surfaces, and Lenses**

R is + if the center of curvature is on the side the light goes to
R is – otherwise

f is + for a concave mirror or converging lens
f is – for a convex mirror or diverging lens

y is +, but y' is + (erect image) or – (inverted image)

If m is +, the image is erect
If m is –, the image is inverted

s is + if the object is on the side the light comes from (real object)
s is – otherwise (virtual object)

s' is + if the image is on the side the light goes to (real image)
s' is – otherwise (virtual image)