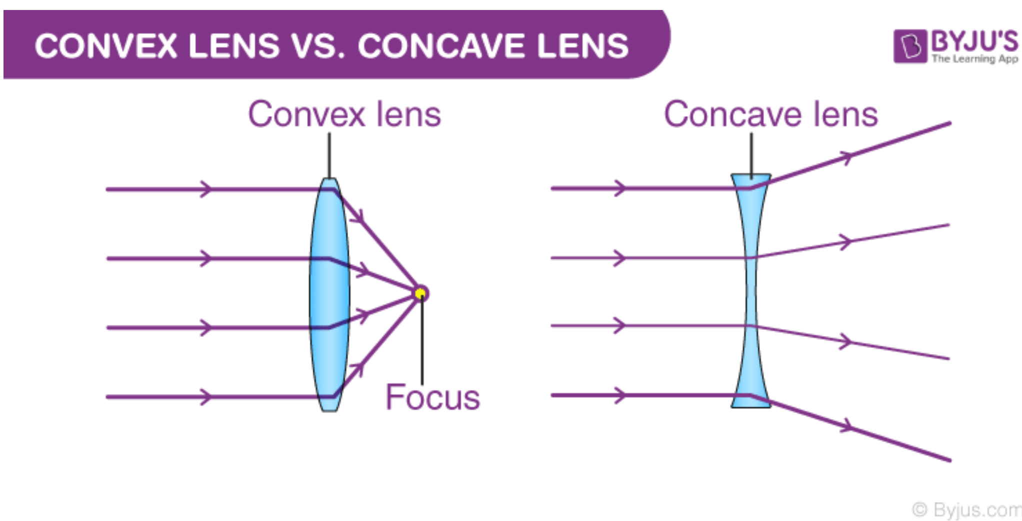
Optics!!

Definitions

- Convex/converging: Lens that trys to converge light rays to a certain focal point.
- Concave/diverging: Lens that diverges (spreads out light rays). We can continue the diverging light rays behind the lens to find the apparent focal point.



Relevant formula

1. $P = \frac{1}{f}$, $power = \frac{1}{focal\,length}$
2. $P = P_1 + P_2 + P_3 + \ldots$, $total\,power = power\,of\,lens\,1 + power\,of\,lens\,2 + \ldots$
3. $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$, $\frac{1}{focal\,length} = \frac{1}{object\,distance} + \frac{1}{image\,distance}$
4. $m = \frac{v}{u}$, $magnification = \frac{image\,height}{object\,height}$

Cases of ray diagrams

Case 1

Let's say we have a **converging** lens with object distance **further** than focal length. We get our normal diagram as lens has enough power to converge the **shallow** light rays hitting it. This is convex case 1 in the diagram below.

Case 2

We have a **converging** lens with object distance **closer** than focal length. We get that our lens does not have enough power to converge the light rays as they are too **steep** and produces diverging light rays. This produces virtual image behind the object. This is convex case 2 in the diagram.

Case 3

We have a **diverging** lens. This will produce a virtual image in between the object and the lens. This does not depend on whether the object is closer than the focal distance or further away from the lens.