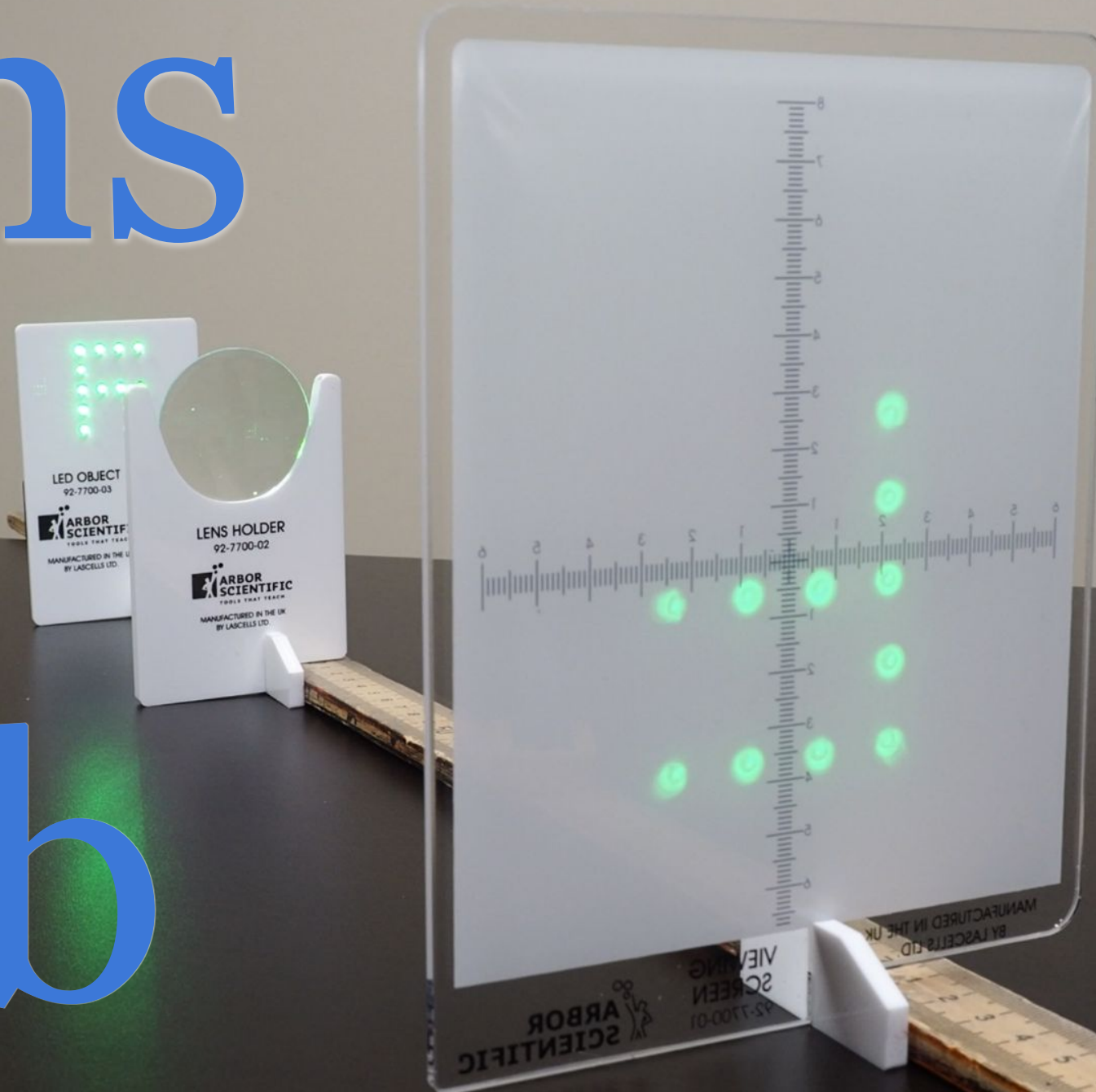
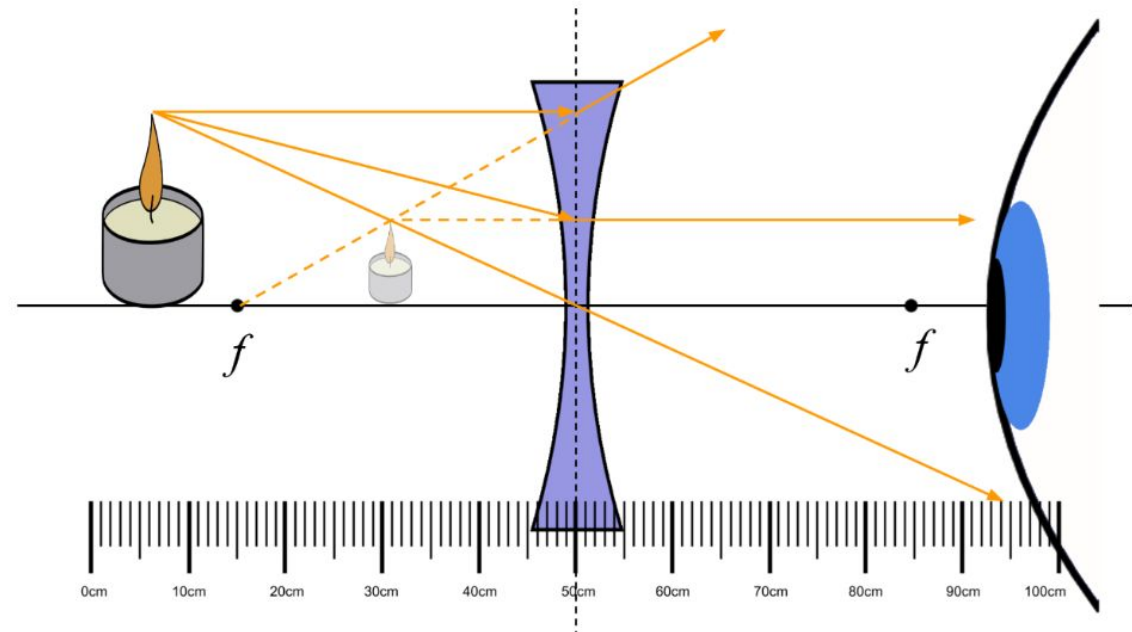
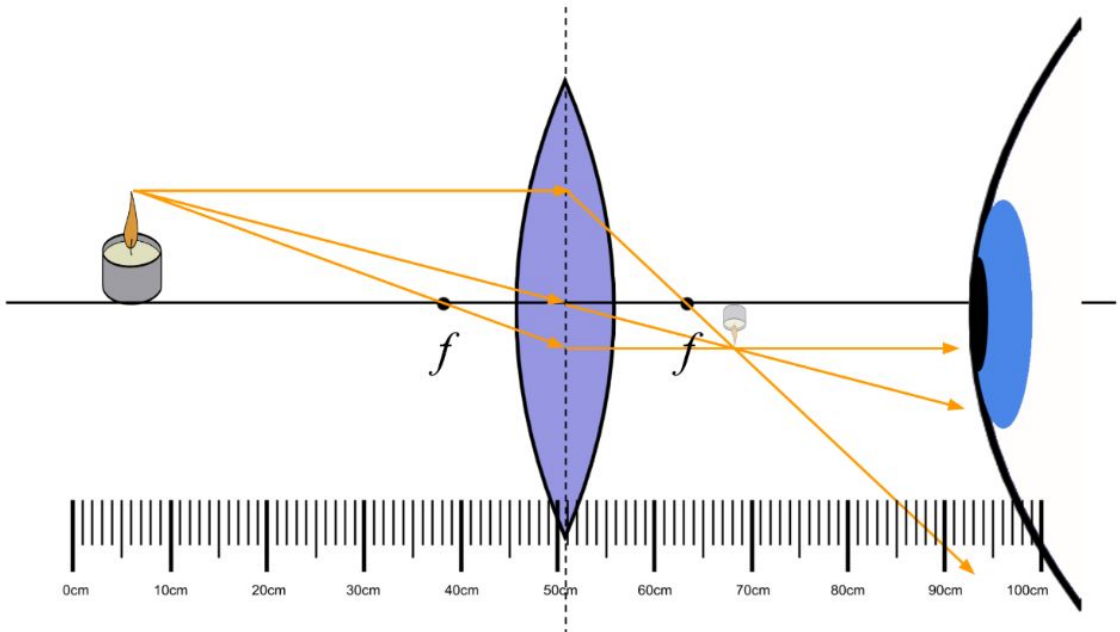
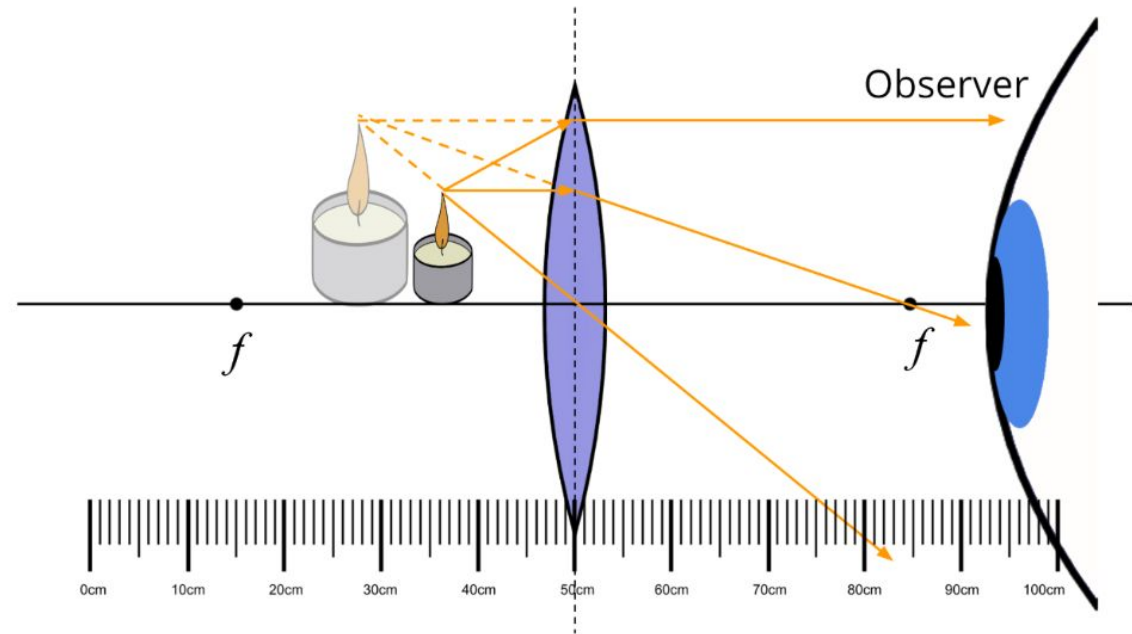
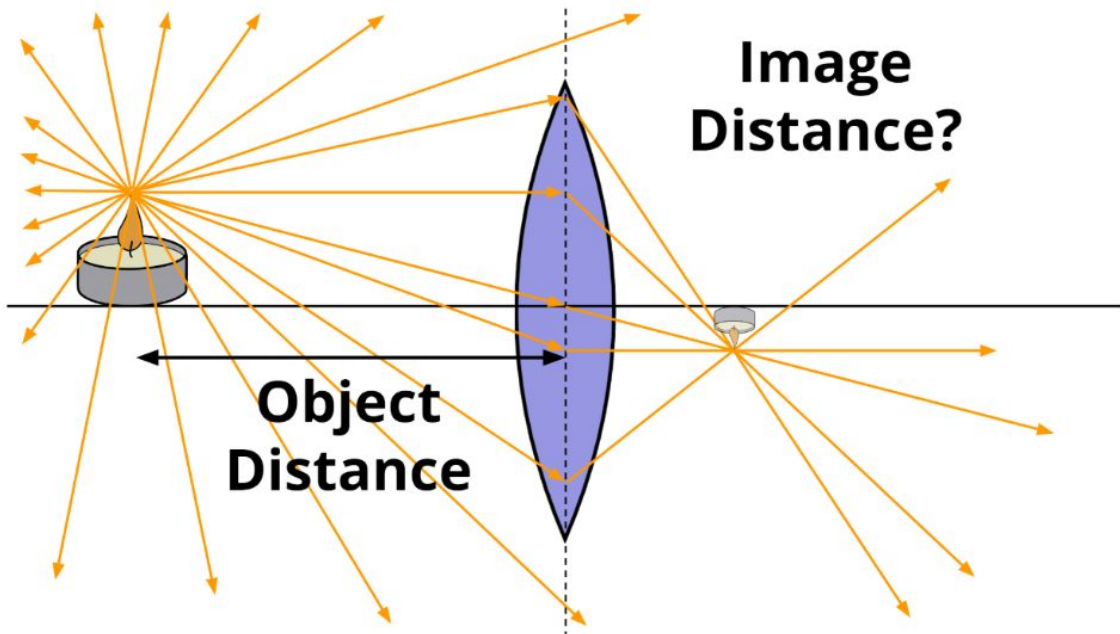


Lens

Lab



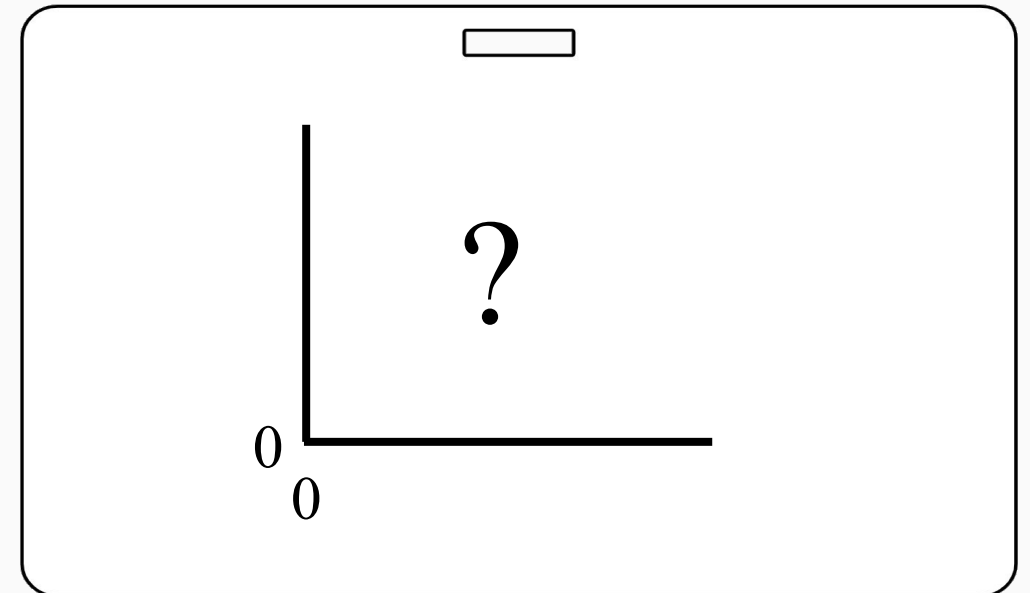


Title: Lens Lab

Purpose: To determine the relationship between...

Data:

...	...



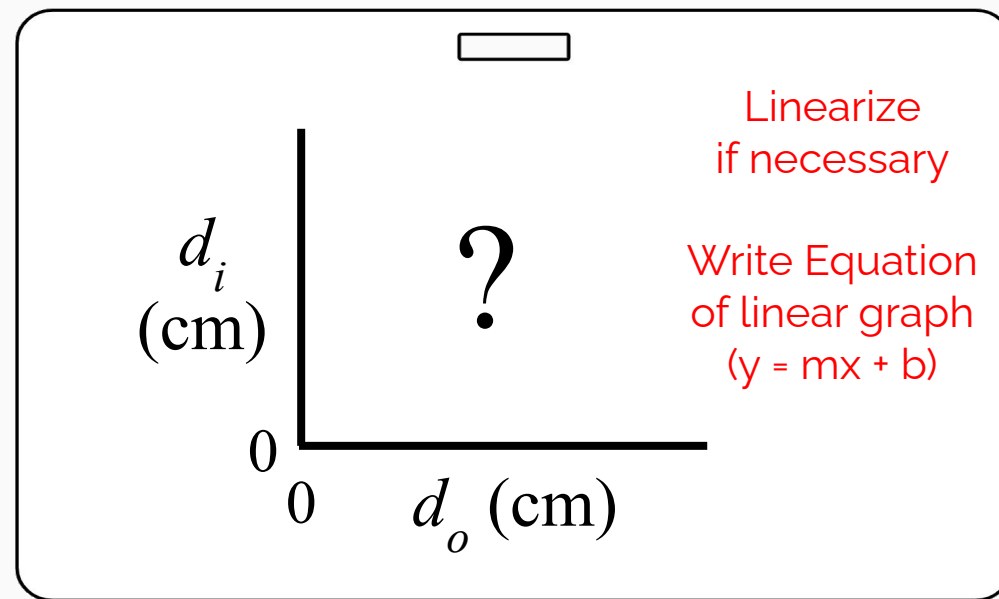
Purpose: To determine the relationship between the distance a real image is formed by a converging lens and the distance the object is from the lens.

Data:

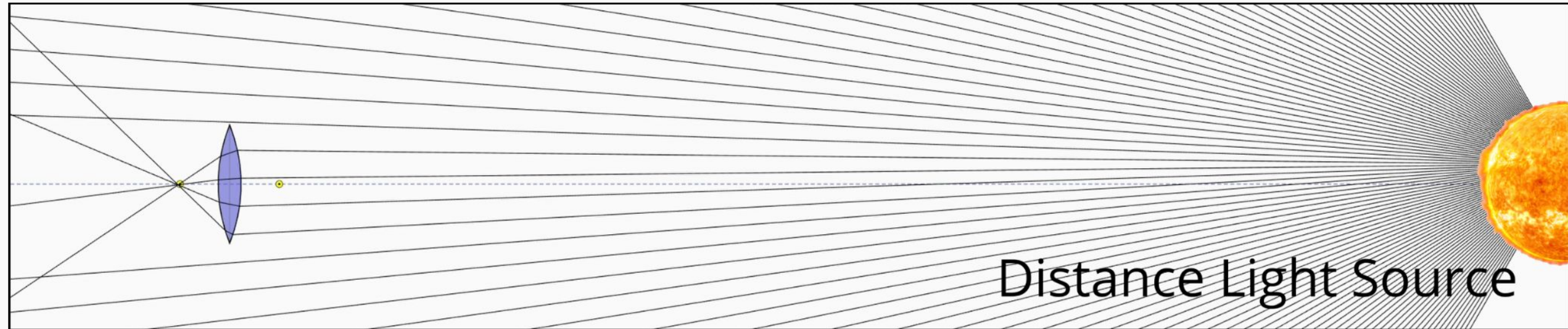
Dependent Variable

d_o (cm)	d_i (cm)
...	...

Independent Variable

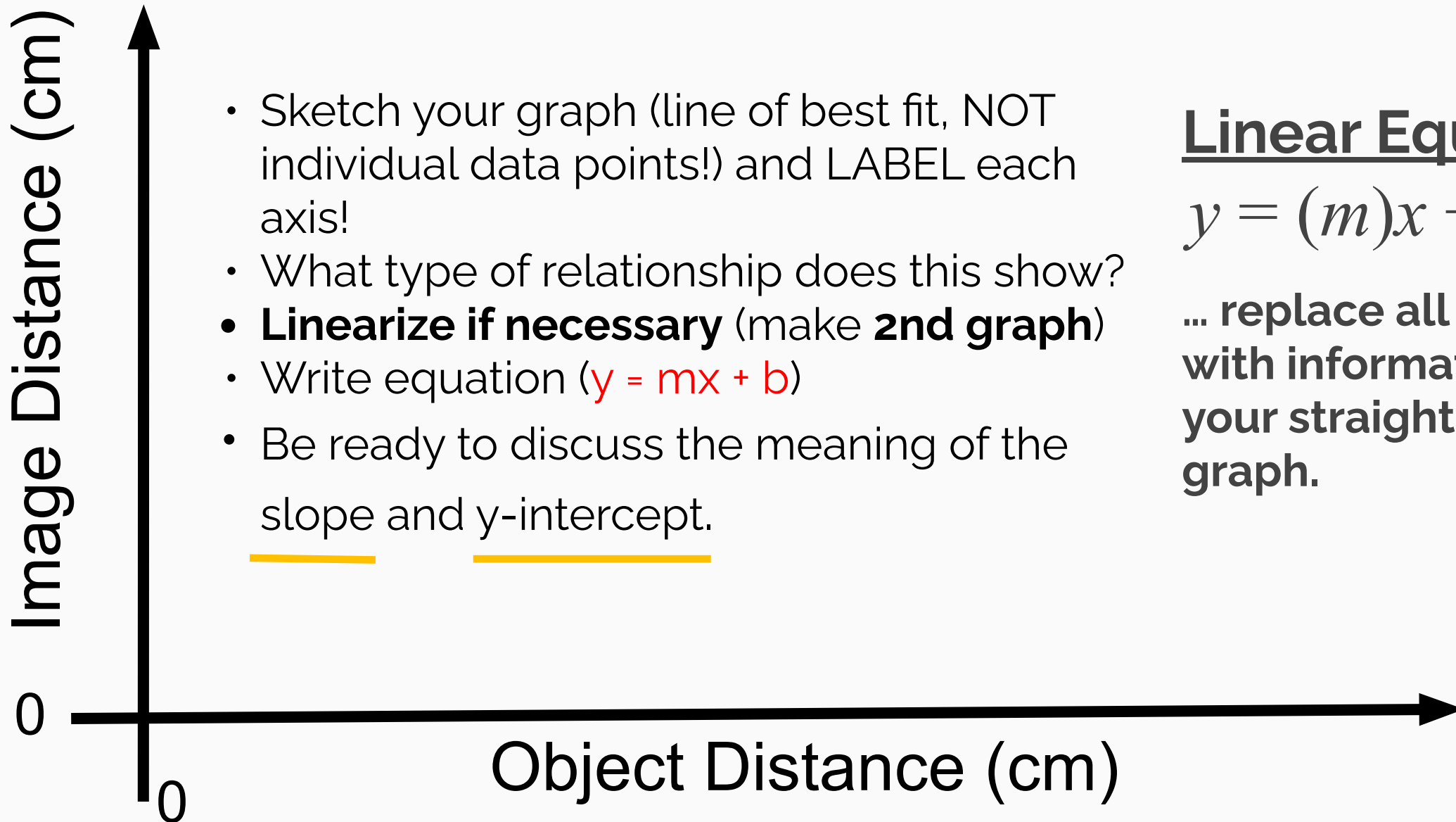


Finding the Focal Length Distance



Light rays from a **distant point light source can be approximated as traveling parallel with one another**. This is especially true of light from our Sun or other stars. *The sun is approximately 93 million miles away from the Earth.*

These nearly parallel light rays will be focused at the focal point of the converging lens.



- Sketch your graph (line of best fit, NOT individual data points!) and LABEL each axis!
- What type of relationship does this show?
- **Linearize if necessary** (make **2nd graph**)
- Write equation ($y = mx + b$)
- Be ready to discuss the meaning of the slope and y-intercept.

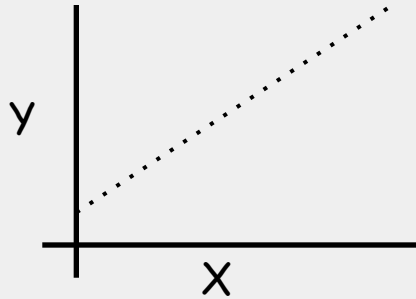
Linear Equation:

$$y = (m)x + b \rightarrow ?$$

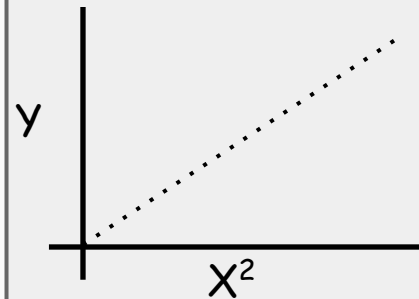
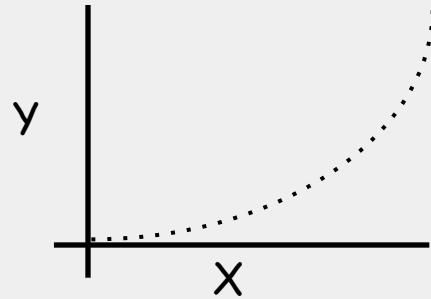
... replace all 4 letters with information from your straight line graph.

Patterns in Nature

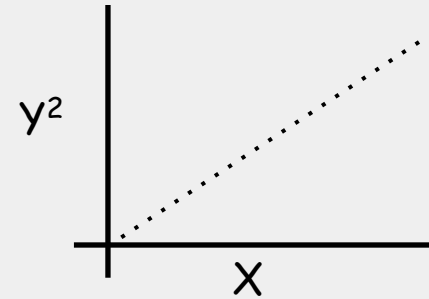
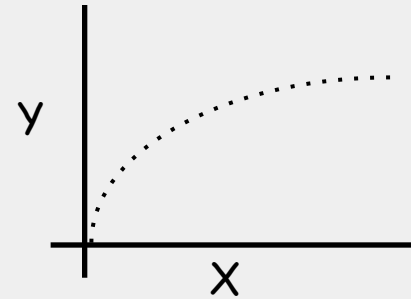
Linear Relationship



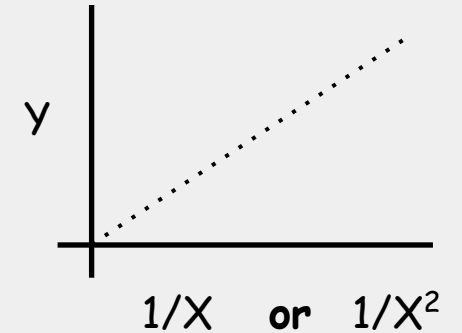
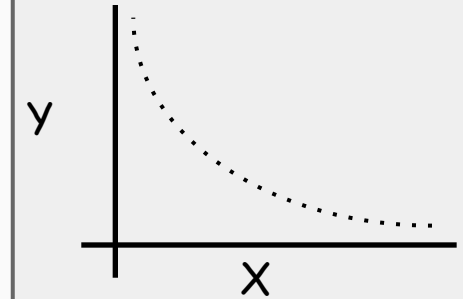
Top-opening Parabola



Side-opening Parabola



Hyperbolic Relationship



To "Linearize" or "Re-express"

Algebraic Representation of Relationship

$$y = mx + b$$

$$y = mx^2 + b$$

$$y^2 = mx + b$$

$$y = m(1/x) + b$$
$$y = m(1/x^2) + b$$

Y-Intercept Rules:

5% Rule: If the y-intercept is less than 5% of the maximum y-value, then you can say that it is insignificant or zero.

Logic: If you can reason that the y-intercept should be zero. You can say its is zero.

$$\frac{1}{d_i} = (-1)\frac{1}{d_o} + .104\frac{1}{cm}$$

$$\frac{1}{d_i} = (-1)\frac{1}{d_o} + .104\frac{1}{\text{cm}}$$

y-intercept = 1/focal length

Symbol: $1/f$

Units: 1/cm

**General
Equation**

$$\frac{1}{d_i} = -\frac{1}{d_o} + \frac{1}{f}$$

“Thin-lens Equation”

$$\frac{1}{d_o} + \frac{1}{d_i} = \frac{1}{f}$$