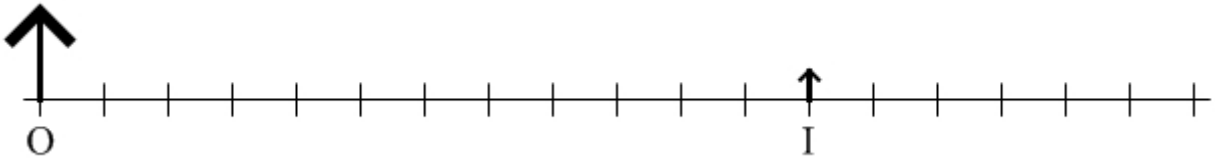


**PROBLEM 1 – 10 points**

When an object is placed at the position O in the diagram, a single mirror creates an upright virtual image at position I. The image is exactly  $\frac{1}{3}$  the size of the object, and the image is located 12 cm from the object (the tick marks in the diagram are 1 cm apart).

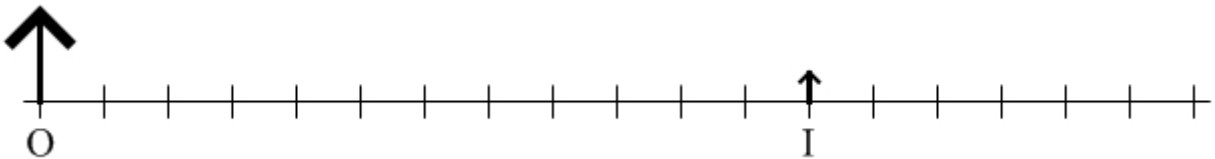


Your job is to determine the location and the type of mirror being used.

[3 points] (a) Determine the focal length of the mirror.

[3 points] (b) Show, as accurately as possible, both the position of the mirror, and its shape, on the diagram, and sketch a ray diagram that shows how the mirror creates the image.

Here's a second copy of the diagram just in case you'd like to re-draw your diagram neatly.



[4 points] (b) If the object is moved a little bit closer to the mirror, what will the image do?  
**Select the two true statements** from the list below.

- The image will increase in size.
- The image will decrease in size.
- The image will remain the same size.
- The position of the image will shift toward the mirror.
- The position of the image will shift away from the mirror.
- The position of the image will remain the same.

**PROBLEM 2 – 10 points**

You have a mirror, and you are trying to determine what kind of mirror it is. You make the following observations, about the image created when an object is placed at a particular point in front of the mirror.

[2 points] (a) The mirror creates a virtual image of the object. Based on this observation, what kind of mirror could this be? **Select all that apply.**

a concave (converging) mirror     a convex (diverging) mirror     a plane mirror

[2 points] (b) The mirror creates an upright image of the object. Based on this, and the previous observation, what kind of mirror could this be? **Select all that apply.**

a concave (converging) mirror     a convex (diverging) mirror     a plane mirror

[2 points] (c) The image created by the mirror is larger than the object. Based on this observation, and the previous observations, what kind of mirror could this be? **Select all that apply.**

a concave (converging) mirror     a convex (diverging) mirror     a plane mirror

[2 points] (d) If the object distance is 15 cm, and the image is twice as large as the object, find the image distance and the mirror's focal length.

[2 points] (e) Sketch a ray diagram for the situation described in part (d). The tick marks on the diagram are 5 cm apart.

