Name_____ Pd_____

"Plane" Old Concave Mirrors Convex Me

1. A vanity mirror at home magnifies your image 3 ½ times when you are sitting 42 cm in front of its surface. What are the focal length and radius of curvature of the mirror?

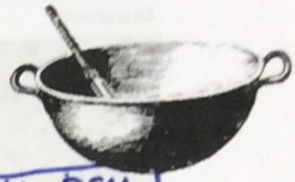
$M = \frac{-d_i}{d_o}$ $M = +3.5$ d_o

$3.5 = \frac{-d_i}{42}$ $\frac{1}{f} = \frac{1}{42} + \frac{1}{-147}$

$d_i = -147\text{cm}$ $\frac{1}{f} = .01701$

$f = 58.8\text{cm}$
$R = 117.6\text{cm}$

2. You hold a 7 cm wide whisk at a distance of 5 cm from the bottom of a hemispherical, polished, metal mixing bowl. The mixing bowl has a radius of 14 cm. Describe the image of the whisk that you would see. Include the type, magnification, width, and apparent distance from the bottom of the bowl. Would you be able to see this image on a sheet of paper placed at just the right distance? Explain your answer.



$h_o = 7\text{cm}$ $R = 14\text{cm}$ $M = \frac{-d_i}{d_o} = \frac{-(-17.5)}{5} = 3.5$

$d_o = 5\text{cm}$ $f = 7\text{cm}$

$\frac{1}{7} = \frac{1}{5} + \frac{1}{d_i}$ $3.5 = \frac{h_i}{h_o} = \frac{h_i}{7}$

$d_i = -17.5\text{cm}$ $h_i = 24.5\text{cm}$

VIRTUAL, RSU
$M = +3.5$
$w_i = (h_i) = 24.5\text{cm}$
$d_i = -17.5\text{cm}$
No, it's a virtual image

3. When an object is placed 25 cm in front of a convex mirror, it forms an image that looks like it's 16 cm behind the mirror and 8 cm tall. What's the magnification of the image? What was the object's height? At what distances could you place the object to get a real image?

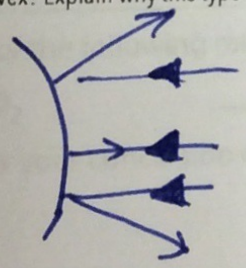
$M = \frac{-d_i}{d_o} = \frac{-(-16)}{25} = .64$

$.64 = \frac{h_i}{h_o} = \frac{8}{h_o}$ $h_o = 12.5\text{cm}$

$\frac{1}{f} = \frac{1}{25} + \frac{1}{-16}$ $f = -44.44$

$M = +.64$
$h_o = +12.5\text{cm}$
You can NEVER get a real image with a convex mirror.

4. Mirrors above fireplaces or on walls across from windows in colonial houses were never plane mirrors. Were they concave or convex? Explain why this type of mirror was chosen.



Convex, it would spread the light throughout the room.

5. An astute jewelry salesman thinks he remembers some of the lectures from his high school Physics class and decides to put a 3 cm sapphire in front of a mirror of focal length 27 cm and a width of 15 cm. He places the brilliant gem 30 cm in front of the mirror's surface. Will he attract more sales? Even if he will, where could he place the sapphire to make sales skyrocket?

$\frac{1}{27} = \frac{1}{30} + \frac{1}{d_i}$ $d_i = 270\text{ cm}$

$M = \frac{-270}{30} = -9$

To make the gem fill the mirror, $h_i = +15\text{cm}$

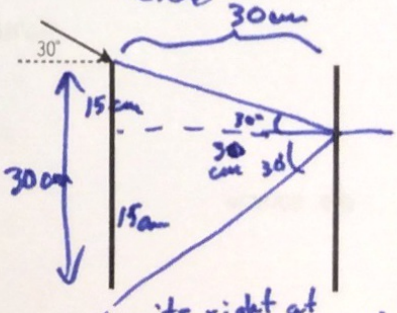
$M = +5 = \frac{-d_i}{d_o}$ $d_i = -5d_o$

$\frac{1}{27} = \frac{1}{d_o} - \frac{1}{5d_o} = \frac{4}{5d_o}$ $d_o = 21.6\text{cm}$

Probably not. Buyers will only see a big (9x) blue blob. Putting it at 21.6 cm in front would fill the mirror exac

6. Two, 30 cm tall, plane mirrors are placed parallel to each other at a distance of 30 cm apart. A laser shines from the top corner of one mirror toward the other mirror at an angle of 30° as shown. How many times will the laser beam bounce off of the mirrors before exiting the system?

One bounce!



exits right at the bottom of the 1st mirror