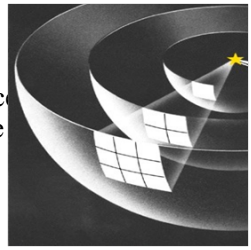
5.A.2 - Reflection

Wave Fronts

It is convenient to think of light traveling in waves tha are aligned.

From a point source, the wave surface is spherical.

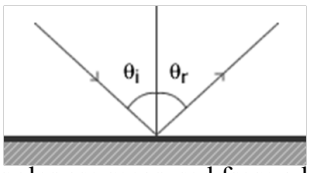
At great distance from the sourc the curvature is small, and can be thought of as a plane wave.



Law of Reflection

Absorption and re-emission of light is reflection. Without it, we couldn't see!

A light ray approaches a mirror at the angle of incidence: θ_i, and leaves at the angle of reflection: θ_r.

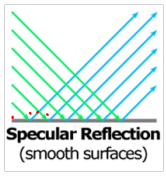


$\theta_i = \theta_r$
Or:
$\theta_1 = \theta_2$

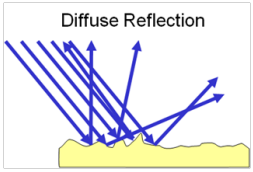
Angles are measured from a line normal (perpendicular) to the surface.

Reflection Types

Specular: rays reflect off a smooth surface parallel to each other.



Diffuse: rays reflect off a rough surface in all directions.



Note on Reflection

All surfaces are rough at the microscopic scale – how can specular reflection occurs at all?

If the dimensions of the surface irregularities are LESS than the light's wavelength, specular reflection happens; otherwise reflection is diffuse.

For mirrors, irregularities <100 nm are necessary. Why 100 nm?

Visible light is 390 – 700 nm: greater than 100 nm.

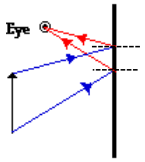
Mirror Grinder

Ray Diagrams 1

Trace the path that light follows using a ray diagram.

1. Start the light beam from a source: have it strike the mirror at the angle of incidence.

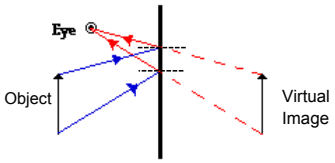
The reflected ray leaves the surface and enters your eye at the angle of reflection.



Ray Diagrams 2

2. Tracing the reflected ray "into the mirror" shows where the object is preceived to be.

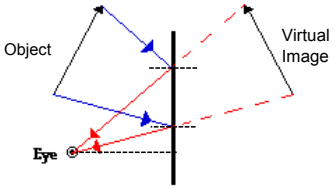
The image that one sees “inside” the mirror is called a virtual image.



Lateral Inversion

We see a backwards "mirror image" of ourselves.

A ray diagram shows that points farther from the eye have a larger reflection angle than those closer.



It's Backwards!!

Look at yourselves in the plane m

Homework

5.A.2 Problems.
Due: Next Class.