Physics 234
Homework 3 (Due Wednesday, February 3rd)
Mirrors

Problem 1.
You want to mount a flat mirror on the wall and stand upright in front of it to see yourself. If your height is h, what is the smallest mirror you can use to see your entire self at once?

Problem 2.
Prove that if a plane mirror is rotated through an angle α the reflected beam is rotated through an angle 2α. Show that this result is reasonable for $\alpha = 45°$.

Problem 3.
A concave shaving mirror has a radius of curvature of 35 cm. It is positioned so that the image of a man's face is 2.5 times the size of his face. How far is the mirror from the man's face?

Problem 4.
A short linear object of length L lies on the axis of a spherical mirror, a distance o from the mirror.

a) Show that its image will have a length L' where

$$L' = L(\frac{f}{o - f})^2 \tag{1}$$

b) Show that the longitudinal magnification $m' = m^2$, where $m' = L'/L$, and $m = i/o$.

See the next page for the last problem

Problem 5.

Fill in the table below. Each column refers to a spherical mirror and a real object. Distances are in cm. If a number has no plus or minus sign in front of it, find the correct sign.

type	Concave					
f(cm)	20		+20			20
r(cm)					-40	
i(cm)					-10	
o(cm)	+10	+10	+30	+60		
m		+1		-0.5		+0.10