Physics 132 Exam #2

- Partial credit will be awarded. However, you must show/explain your work. A correct answer without explanatory material will not receive full credit.
- Clearly indicate your final result with a box or circle.
- If you need more space go onto the back and indicate "OVER".

Equation sheet is separate.

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1) **(14 pts)** The figure shows light passing through two narrow, closely spaced slits. The graph shows the light intensity pattern seen on a screen located a large distance behind the slits.
   a) Carefully draw a graph on the axes provided to show the light intensity pattern if the right slit is blocked, allowing light to go only through the left slit.
   b) Explain why the graph will look this way.

2. **(6 pts)** On the diagram are shown two completed rays for a *diverging* lens. As carefully as possible complete the path of ray A and indicate where ray B came from. Explain.
3. **(15 pts)** A 600 nm laser beam passes through a 300 slits/mm diffraction grating.
   - How many bright spots will be observed on a screen a large distance behind the grating?
   - If the screen is 3 m from the grating how far from the central spot will the first spot be?

4. **(15 pts)** A laser beam is incident on a plate with narrow double slits (spacing $d$). On a screen a distance $L$ ($>>d$) away you see an interference pattern. You observe a pair of adjacent bright spots to be separated by a distance $h$.
   
   What is the wavelength of the light? (Express your result in terms of $d$, $L$, $h$.)
5. (10 pts) A lighted candle is placed a short distance from a plane mirror as shown. The image of the flame is located
a) at A
b) at B
c) at C
d) at M
e) no image formed, object is not directly in front of mirror

Circle the correct response and indicate on the diagram how you got your answer.

6. (10 pts) A laser beam is incident from air onto the surface of still water at an angle of $\theta=30^\circ$ with respect to the horizontal. On the diagram sketch any other rays. At what angle with respect to the normal will the beam travel in the water?

7. (10 pts) Light is normally incident upon one face of a right-angle glass prism as shown in the figure.
- Find the angle of incidence, with respect to the normal, on the face marked with a "*".
- What is the minimum index of refraction of the glass so that there is total internal reflection?
8. **(20 pts)** A converging lens has a focal length of 10 cm. A 2 cm tall object is placed 15 cm from the lens.
   a) Sketch an appropriate ray diagram using the grid below.
   b) Using your diagram find the location of the image, and determine by how much it is magnified or reduced, and whether it is upright or inverted.
   c) Now *calculate* the image location, the amount of magnification or reduction, and whether it is upright or inverted.
   d) Do your numerical results agree qualitatively with your diagram?