No books or paper notes are allowed. A one page formula sheet is attached as the last page of this test. It may be removed and need not be handed in.

Show all your work. No credit will be given for answers appearing without supporting calculations. Partial credit may be awarded based on clarity and completeness of solution.

1. The diffraction pattern shown below occurs when laser light passes through a circular aperture of diameter 0.600 mm and falls onto a screen located 7.00 m away. Calculate the wavelength of the light.

Figure was similar to Fig. 38.9(a) page 1056 of Crumett & Western but with only one spot.
2. Light of wavelength 633 nm passes through a double slit, yielding a diffraction pattern shown below. The pattern is 4.50 m from the double slits.

Figure was similar to Fig. 38.P2 on page 1074 of Crummett & Western

(a) Calculate the width of the individual slits.

(b) Calculate the slit separation.
3. The pupil of a person's eye is 5.00 mm. What distance apart must two small objects be if their images are just resolved (by the Rayleigh criterion) when they are located 250 mm from the eye and illuminated with a wavelength of 500 nm?
4. (a) Below are representations of three diffraction patterns all formed with the same wavelength light and with the slit-to-screen distance the same, but with different combinations of multiple slits. The darkened areas represent bright spots (think of pencil marks as red light on a white background, as in the class demonstrations.)

Which pattern is produced by slits with the greatest separation? ________

Which pattern is created by illuminating the greatest number of slits? ________

Figures were like Fig. 37.19 page 1041 and 37.25 on page 1045 of Crummett & Western

(b) Below are graphs of the intensity versus position for a single slit diffraction pattern created with identical light sources and slit-to-screen distance.

Which slit is wider? ________

Figures were similar to Fig. 38.7 on page 1055 and 38.12(a) on page 1059 of Crummett & Western