TEST # 3. PHYS 204. SPRING 2014

LAST NAME, FIRST NAME:

Rules for the exam:

1. The exam will start promptly at 5pm and finish at 6:40PM. After 6:40pm the proctor will leave the room and he will not accept any more exams. It is your responsibility to give the exam to the proctor before 6:40pm.

2. You are not supposed to speak to the proctors under any circumstances. If you ask any question, you will receive zero points and ask to leave the room immediately. No discussions are allowed with the proctors.

3. You can not leave the room under any circumstances. If you leave the room your exam will be terminated and you will not be allowed to come back to the room.

4. You are allowed to have one sheet of paper as a cheat-sheet with no extra add-ons.

5. If you arrive to the exam after 5:10pm, you will not be allowed to do the exam.

6. In the case of any conflict, the proctors will have all the authority to decide how to solve it and you are oblige to respect any decision of the proctor without any discussion.

7. You are not allowed to speak to proctors, before, during and after the exam under any circumstances.

8. Any violation to the above rules will result in immediate termination of your exam.

9. Any instance of cheating will be punished severely.

10. By signing this sheet you attest that you agree with the above rules. If you do not sign this sheet, you will need to leave the exam.

1. (30 points) Lenses

An object 1.2 cm tall is at a distance 10cm from a convex (converging) lens with $f = 20$cm. (a) (24 points) Use a ray diagram with three rays to find the approximate location of the image. (b) (3 points) is the image upright or inverted? (c) (3 points) Is the image real or virtual?

2. (35 points)

Consider the interference pattern produced by monochromatic light with $\lambda = 500nm$, incident on two identical parallel slits of separation (between centers) $d = .250$ mm. (a) (15 points) Calculate the angle that locates the fourth-order bright fringe. (b) (20 points) If you replace the double slit by a single slit of width $W = d/4$, calculate the angle that locates the first dark fringe in the diffraction pattern obtained with the same wavelength as in (a).

3. (35 points) Relativity

3.1, 20 points. A spaceship travels at a constant speed v from Earth to a planet orbiting a distant star. When the spaceship arrives, 12 years have elapsed on Earth, and 9.2 years have elapsed on board the ship. Find v in units of c.

3.2, 15 points. A spacecraft of length 100 m (as measured by a person on the spacecraft) travels away from earth with speed $0.7c$ relative to Earth. Calculate the length of the spacecraft as observed by a person in the Earth.