This print-out should have 13 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering. The due time is Central time.

Please notice that for your homework to be considered towards your grade, it needs to be submitted one hour before the corresponding recitation starts.

PLEASE REMEMBER THAT YOU MUST CARRY OUT YOUR CALCULATIONS TO AT LEAST THREE SIGNIFICANT FIGURES. YOUR ANSWER MUST BE WITHIN ONE PERCENT OF THE CORRECT RESULT TO BE MARKED AS CORRECT BY THE SERVER.

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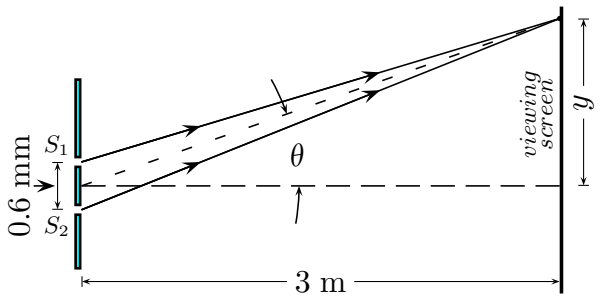
001 (part 1 of 1) 4 points

A double-slit interference experiment is shown below.



If the third order bright fringe falls a distance of 5 mm from the center of the pattern, what is the wavelength of the light used? Answer in units of nm.

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002 (part 1 of 2) 4 points

A pair of narrow, parallel slits separated by 0.39 mm are illuminated by green light of wavelength 551 nm. An interference pattern is observed on a screen 1.28 m away from the plane of the slits.

Calculate the distance from the central maximum to the first bright region on either side of the central maximum. Answer in units of mm.

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003 (part 2 of 2) 3 points

Calculate the distance between the first and second dark bands. Answer in units of mm.

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004 (part 1 of 1) 4 points

Waves from a radio station have a wavelength of 466 m. They travel by two paths to a home receiver 17.6 km from the transmitters. One path is a direct path, and the second is by reflection from a mountain directly behind the home receiver.

What is the minimum distance from the mountain to the receiver that produces destructive interference at the receiver? (Assume that no phase change occurs on reflection from the mountain.) Answer in units of m.

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005 (part 1 of 2) 4 points

Two narrow silts are separated by a distance 0.5 cm. Their interference pattern is to be observed on a screen a large distance 0.5 m away.

Calculate the spacing Δy of the maxima on the screen for light of wavelength 490 nm. Answer in units of μm.

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006 (part 2 of 2) 4 points

How close together should the silts be placed for the maxima to be separated by 0.5 mm for this wavelength and screen distance? Answer in units of mm.

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007 (part 1 of 1) 4 points

In a Young's interference experiment, the two slits are separated by 0.237 mm and the incident light includes light of wavelengths $\lambda_1 = 616$ nm and $\lambda_2 = 513.333$ nm. The overlapping interference patterns are formed on a screen 1.84 m from the slits.

What is the minimum distance from the center of the screen to the point where a bright line of the λ_1 light coincides with a bright line of the λ_2 light? Answer in units of cm.

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008 (part 1 of 2) 4 points

A screen is illuminated by 491 nm light as shown in the figure below.

The distance from the slits to the screen is 7.1 m .

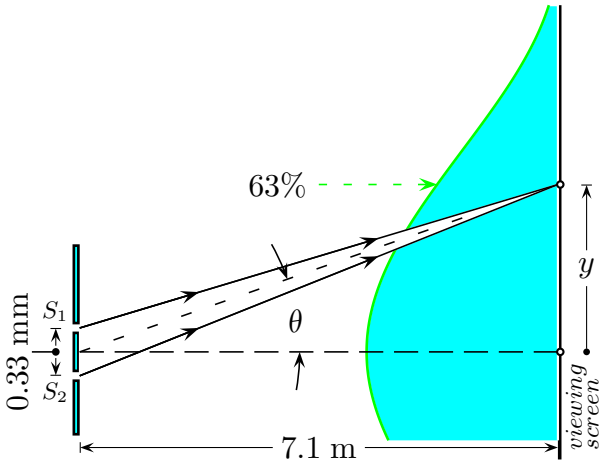

Figure: Not drawn to scale.

Find the minimum positive phase angular value ϕ such that $\frac{I}{I_0} = 63\%$, where I_0 is the intensity at the central maximum and I is the intensity at the position y on the screen. Answer in units of °.

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009 (part 2 of 2) 3 points

Find the difference in path length for the rays from the two slit. Answer in units of nm.

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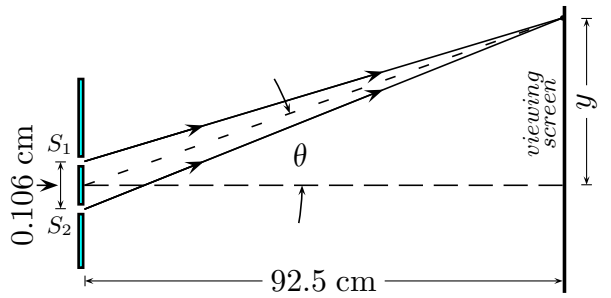
010 (part 1 of 1) 4 points

The slits S_1 and S_2 are illuminated with monochromatic light of wave length 656 nm.



Calculate the smallest distance y above the central maximum for which the average intensity on the screen is 0.795 of the maximum. Answer in units of m.

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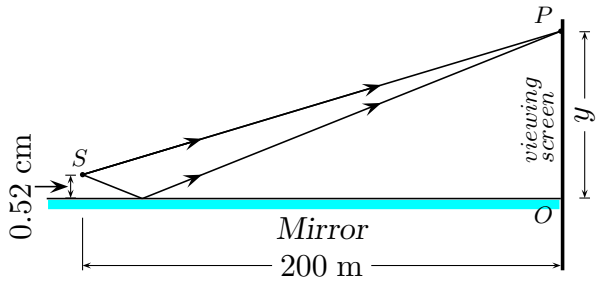
011 (part 1 of 1) 4 points

A source S with wave length length 509 nm is a perpendicular distance 0.52 cm from a mirror as seen in the figure below. Interference fringes are produced on a screen a distance 200 m from the source as a result of direct rays from the source and reflected rays off the mirror.



Find the perpendicular distance y ($\overline{OP}$) from the reflecting mirror for the sixth bright band at P. Answer in units of mm.

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012 (part 1 of 1) 4 points

A possible means for making an airplane invisible to radar is to coat the plane with an anti-reflective polymer.

If radar waves have a wavelength of 4.53 cm and the index of refraction of the polymer is $n = 1.51$, how thick would you make the coating? Answer in units of cm.

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013 (part 1 of 1) 4 points

A soap film appears red (of wavelength 650 nm) when viewed with incident white light that is perpendicular to the film. If the index of refraction of the film is 1.68, what is the minimum thickness of the film? Answer in units of nm.