PHYSICS 242 BLOCK 14 DRILL SET, SPRING '17 NAME________________________________

Slide this last drill set under Marteena 306's door any time *before* 7:50 AM Friday, April 28, or give it to me in Marteena 312 *by* 8 AM that day. Each problem uses one different Block 14 objectives equation.

1. We send 589 nm coherent light normal to a diffraction grating. We expect to find a seventh order interference maximum at an angle of –77.7˚. How many slits per millimeter does the grating have? (1 nm = 10^{-6} mm.)

ONE EQUATION USED	SOLUTION	ANSWER
		_______ slits/mm

2. We send 589 nm coherent light normal to a diffraction grating. The fourth zero on one side of the central maximum in the diffraction pattern of each slit occurs at an angle of –77.7˚. What is the width (in μm) of each slit?

ONE EQUATION USED	SOLUTION	ANSWER
		μm

3. Two point sources of 633 nm light, separated by a transverse distance 2.54 cm, are 1.609 km from a lens. Therefore, $\theta_1 = \arctan(y_1/s) = 9.04 \times 10^{-4}$ degree. Using Rayleigh's criterion, find the minimum diameter (in cm) of the circular aperture needed to barely resolve the images of the two sources under ideal conditions.

ONE EQUATION USED	SOLUTION	ANSWER
		cm

4. Two spectral lines have wavelengths of 567.248 nm and 567.284 nm. An ideal diffraction grating has 3800 slits. What is the lowest order required to resolve the two lines?

EQUATION USED (**ONE** EQUAL SIGN)	SOLUTION	ANSWER
=		Order number = ____

5. Monochromatic coherent light waves leave two rectangular slits in phase and at an angle with the normal of 22˚ = 0.38 rad. When the light reaches a distant screen, the waves from the center of one slit are 172˚ = 3.00 rad out of phase with the waves from the center of the other slit, and the waves from the top of either slit are 86˚ = 1.50 rad out of phase with the waves from the bottom of that slit. The intensity at the screen is 0.44 mW/m^2 for these three angles. Calculate the intensity at the screen when all three of these angles are zero.

ONE EQUATION USED	SOLUTION	ANSWER