Oberlin College Physics 103, Fall 2023

Model Solutions to Assignment 12: Wave Superposition and Interference

Problems from *College Physics* by P.P. Urone and R. Hinrichs.

Chapter 27, problem 55: Single slit diffraction of water waves

The boats are protected through destructive interference. Use equation 27.21

$$D \sin\theta = m\lambda, \qquad m = \pm 1, \pm 2, \ldots$$

with $D = 50.0$ m, $\lambda = 20.0$ m, giving

$$\sin\theta = m(0.400) \qquad m = \pm 1, \pm 2, \ldots .$$

There is no angle with m equal to 3 or more, because there is no angle with $\sin\theta$ equal to 1.2 or more. So there are two protected angles:

$$\sin\theta = 0.400 \text{ giving } \theta = 23.6^\circ$$

and

$$\sin\theta = 0.800 \text{ giving } \theta = 53.1^\circ.$$

⟦*Grading:* Last problem assignment. 10 points for any reasonable effort.⟧