

Homework Discussion, Week 11

Physics 1301

Dr. Andersen

Chapter 14

31) a) Use $I = I_0 10^{(\beta/10)}$ to solve for the intensity of 20. The intensity of one will be $I/20$. Put that intensity in $\beta = 10 \log(I/I_0)$ to find the intensity in decibels. b) Since the decibel scale is logarithmic, doubling the number of violins will only increase the intensity by an amount $10 \log 2$.

42) a) (Note, although he doesn't specifically say so, the author of the textbook intended you to solve for the moving plane to be approaching the plane on the ground.) For the moving plane, the frequency he will hear is (observer moving toward, source stationary)

$$f' = (1 + v/u)f$$

while for the plane on the ground, the pilot will hear a shift (source moving toward, observer stationary)

$$f' = \left(\frac{1}{1 - v/u}\right)f$$

where v is the speed of the moving jet. Putting $v = 0.825u$ into the part in parenthesis in both these equations shows that the stationary observer should observe a larger shift. b-c) Just a bit more plugging in the two formulas from a).

Answers: b) 760 Hz c) 4,000 Hz.

Chapter 15

19) a) Use $P = P_{atm} + \rho gh$ and solve for h . b) Since sea water is more dense than fresh water, and h is inversely proportional to ρ , it would be able to dive less deeply.

30) The buoyant force must balance the weight of cargo plus hot air, so

$$F_b = Mg + mg$$

where M is the mass of the cargo, and m is the mass of the hot air, so

$$\rho_{air} V g = Mg + \rho_{hotair} V g.$$

Solving gives

$$\rho_{hotair} = \rho_{air} - \frac{M}{V} = 0.814 \text{ kg/m}^3.$$