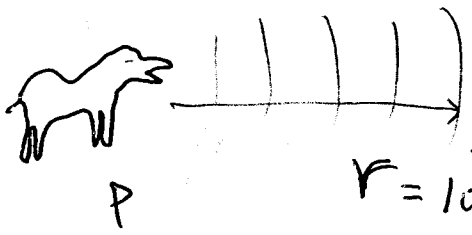
Physics 1C Winter 2010
Quiz 1 form A

1)



$$I = \frac{P}{A} = \frac{P}{4\pi r^2}$$

$$\beta = 50\ dB = 10 \log \frac{I}{I_0}$$

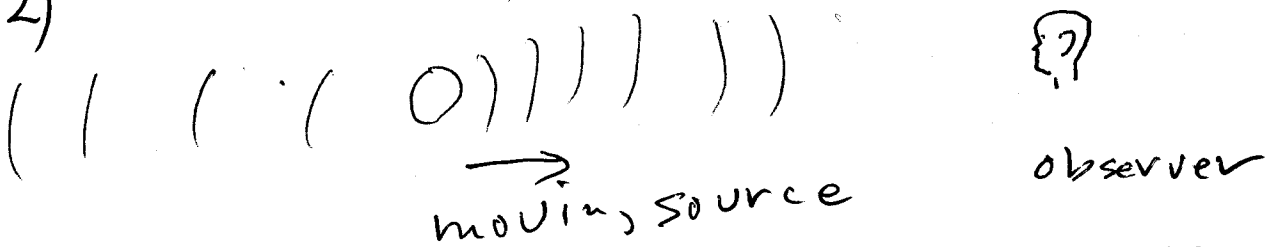
$$\log \frac{I}{I_0} = \frac{50}{10} = 5$$

$$I = I_0 \times 10^5 = 10^{-12} \times 10^5 = 10^{-7}\ W/m^2$$

$$P = 4\pi r^2 I = 4\pi (10^3 m)^2 (10^{-7}\ W/m^2)$$

$$\boxed{P = 1.26\ W}$$

2)



For a moving source the Doppler shift is due to the change in the wavelength of the sound. The wavelength is shorter in the direction toward the observer and longer in the direction away from the observer.

3) The wavelength of microwaves is of the order of 10 cm – About the length of a cell phone antenna –

4) mass – spring oscillation

$\updownarrow \Delta y = 1.5\ cm$

$F = k\Delta y$

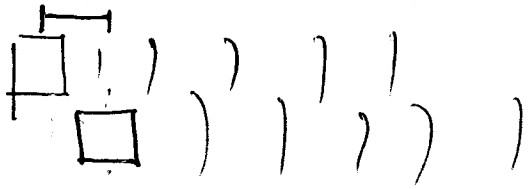
$k = \frac{F}{\Delta y} = \frac{mg}{\Delta y} =$

$\omega = 2\pi f = \sqrt{\frac{k}{m}}$

$f = \frac{1}{2\pi}\sqrt{\frac{k}{m}} = \frac{1}{2\pi}\sqrt{\frac{mg}{\Delta y m}} = \frac{1}{2\pi}\sqrt{\frac{9.8\ m/s^2}{1.5\times10^{-2}\ m}}$

$\boxed{f = 4.07\ Hz}$

5) $\Delta x = 20\ cm$



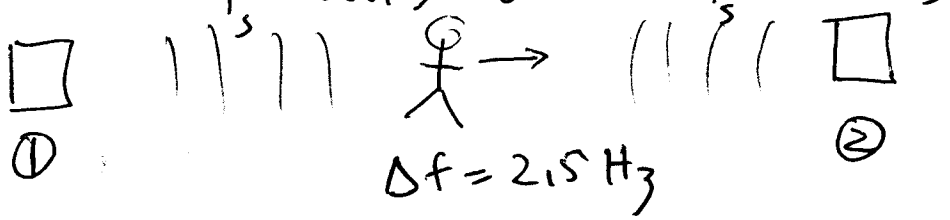
minimum in Intensity due to Destructive Interference

$\Delta x = \frac{\lambda}{2}$

$\lambda = 2\Delta x$

$f = \frac{v}{\lambda} = \frac{v}{2\Delta x} = \frac{340\ m/s}{2(0.2\ m)} = \boxed{850\ Hz}$

6)



$\Delta f = 2{,}5 Hz$

$$f_1 = f_s \left(\frac{V - V_0}{V} \right) = f_s \left(1 - \frac{V_0}{V} \right)$$

$$f_2 = f_s \left(\frac{V + V_0}{V} \right) = f_s \left(1 + \frac{V_0}{V} \right)$$

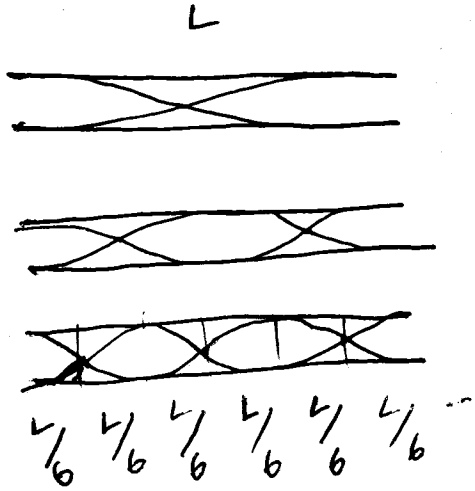
Δf = Beat frequency $= 2{,}5 Hz$

$$\Delta f = f_2 - f_1 = 2 \frac{V_0}{V} f_s$$

$$V_0 = \frac{\Delta f \, V}{2 f_s} = \frac{(2{,}5 Hz)(340 \, m/s)}{2 (1000 Hz)}$$

$$\boxed{V_0 = 0{,}42 \, m/s}$$

7)



There is a node at $\underline{\underline{L/6}}$ from the end.

8)  $F = 200\ N$

$L = 75\ cm \qquad f_1 = 600\ Hz$

$\lambda = 2L \qquad f_1 = \frac{v}{\lambda} = \frac{v}{2L}$

$v = \sqrt{\frac{F}{m/L}}$

$f_1 = \frac{1}{2L}\sqrt{\frac{F}{m/L}} = \frac{1}{2}\sqrt{\frac{F}{mL}}$

$f_1^2 = \frac{1}{4}\frac{F}{mL}$

$m = \frac{1}{4}\frac{F}{L f_1^2} = \frac{200\ N}{4(0.75\ m)(600)^2}$

$m = 1.85 \times 10^{-4}\ kg = \boxed{0.185\ g}$