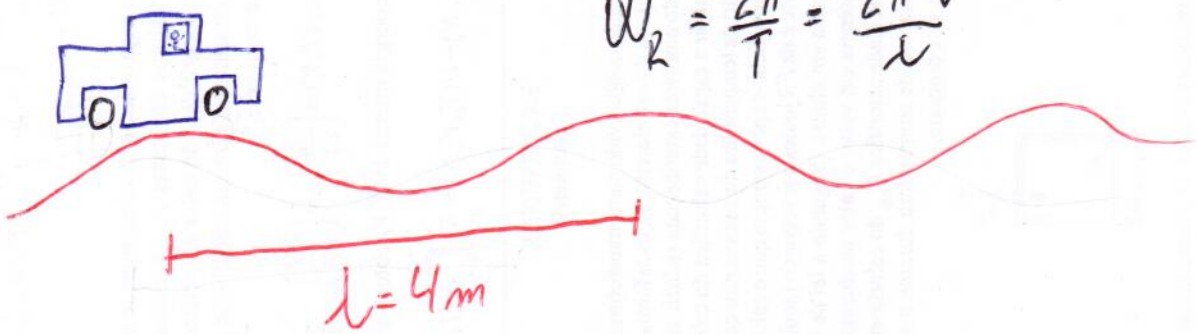
1.19

RESSONÂNCIA: $\omega_R \approx \omega_0$

$$V = \lambda f \Rightarrow \frac{V}{\lambda} = f = \frac{1}{T}$$

$$\omega_R = \frac{2\pi}{T} = \frac{2\pi V}{\lambda}$$



$$\omega_0 = \sqrt{\frac{K}{m_1}}$$

$$m_1 = 1000 + 4.82 = 1328\,Kg$$

$$\omega_0 = \omega_R \Rightarrow \frac{2\pi V}{\lambda} = \sqrt{\frac{K}{m_1}} \Rightarrow \boxed{K = \frac{4\pi^2 V^2}{\lambda^2} \cdot m_1}$$

$F_m = -Kx$

F_P

$F_R = 0 = mg - Kx$

$$x_1 = \frac{m_1 g}{K}$$

$$x_2 = \frac{m_2 g}{K}$$

$$\Delta x = x_1 - x_2 = (m_1 - m_2)\cdot\frac{g}{K} = \frac{(m_1 - m_2)\, g \cdot \lambda^2}{4\pi^2 V^2 m_1}$$

$m_1 = 1328\,Kg$

$m_2 = 1000\,Kg$

$g = 9{,}8\,m/s^2$

$V = 16\,Km/h$

$= \frac{16}{3{,}6}\,m/s$

$\lambda = 4\,m$

$\Delta x = 0{,}04\overline{96}\,m$

$\boxed{\Delta x = 5{,}0\,cm}$

2.17

$$100 = 10 \cdot \log_{10}\left(\frac{I}{I_{REF}}\right)$$

$$I_{REF} = 10^{-12}\ W/m^2$$

$$I_{100} = \frac{Pot}{4\pi \cdot (100)^2} \Rightarrow Pot = I_{100} \cdot 4\pi \cdot 100^2$$

$$I_{500} = \frac{Pot}{4\pi \cdot (500)^2} \Rightarrow Pot = I_{500} \cdot 4\pi \cdot 500^2$$

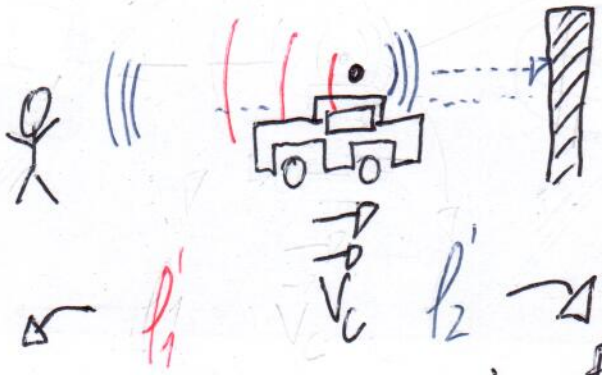
$$I_{100} \cdot 4\pi \cdot 100^2 = I_{500} \cdot 4\pi \cdot 500^2$$

$$\frac{I_{100}}{I_{500}} = \frac{500^2}{100^2} = 25 = \frac{I_{100}}{I_{500}}$$

$$X = 10 \log_{10}\left(\frac{I_{500}}{I_{REF}}\right) = 10 \cdot \log_{10}\left(\frac{I_{100}}{25} \cdot \frac{1}{I_{REF}}\right) =$$

$$= \underbrace{10 \log_{10}\left(\frac{I_{100}}{I_{REF}}\right)}_{100} + \underbrace{10 \cdot \log_{10}\left(\frac{1}{25}\right)}_{-14} = \boxed{X = 86\ dB}$$

2.19



FONTE AFASTANDO

$$\frac{f_1'}{f_0} = \frac{V_S}{V_S + V_C} \Rightarrow \frac{1}{f_0} = \frac{1}{f_1'}\frac{V_S}{V_S + V_C}$$

FONTE APROXIMANDO

$$\frac{f_2'}{f_0} = \frac{V_S}{V_S - V_C} \Rightarrow \frac{1}{f_0} = \frac{V_C}{V_S - V_C}\frac{1}{f_2'}$$

IGUALANDO:
E MANIPULANDO

$$f_2'(V_S - V_C) = f_1'(V_S + V_C)$$

$$\hookrightarrow V_C(-f_2' - f_1') = V_S(f_1' - f_2')$$

OU

$$V_C = V_S\left(\frac{f_2' - f_1'}{f_2' - f_1'}\right) = \boxed{24{,}0\ m/s = V_C}$$

$V_S = 343\ m/s$

$f_2' = 429\ Hz$

$f_1' = 373\ Hz$