

4.1.1

Dane:

$$v_2 = 72 \frac{\text{m}}{\text{h}} = 20 \frac{\text{m}}{\text{s}}$$

$$v_0 = 0 \frac{\text{m}}{\text{s}}$$

$$p = 256 \text{ Hz}$$

$$v = 340 \frac{\text{m}}{\text{s}}$$

Suchane:

$$\Delta p = ?$$

Wzór:

$$p_1' = p \cdot \frac{v}{v - v_2} \rightarrow \text{wagon się oddala}$$

$$p_2' = p \cdot \frac{v}{v + v_2} \rightarrow \text{wagon się oddala}$$

Rownożenie

$$\Delta p = p_1' - p_2'$$

$$\Delta p = p \frac{v}{v - v_2} - p \frac{v}{v + v_2} = p \left[\frac{v(v + v_2) - v(v - v_2)}{(v - v_2)(v + v_2)} \right] =$$

$$= p \left[\frac{2vv_2}{v^2 - v_2^2} \right]$$

$$\Delta p = 256 \text{ Hz} \left[\frac{2 \cdot 20 \frac{\text{m}}{\text{s}} \cdot 340 \frac{\text{m}}{\text{s}}}{340^2 \frac{\text{m}^2}{\text{s}^2} - 20^2 \frac{\text{m}^2}{\text{s}^2}} \right] =$$

$$= 256 \text{ Hz} \left[\frac{13600 \frac{\text{m}^2}{\text{s}^2}}{115200 \frac{\text{m}^2}{\text{s}^2}} \right] = 256 \text{ Hz} \cdot 0,118055 =$$

$$= 30,2 \text{ Hz} \approx 30 \text{ Hz}$$

$$\text{Odp: } \Delta p \approx 30 \text{ Hz}$$