

$$1) \quad f_1 = f_0 \cdot \left(2^{\frac{1}{12}}\right)^9 = 440 \text{ Hz} \cdot 2^{\frac{3}{4}} = 740 \text{ Hz}$$

$$s = 26,81 \cdot \frac{\frac{f}{\text{kHz}}}{1,96 + \frac{f}{\text{kHz}}} - 0,53 = 6,82 \text{ Bark}$$

$$m = 100 \cdot s = 682 \text{ mel}$$

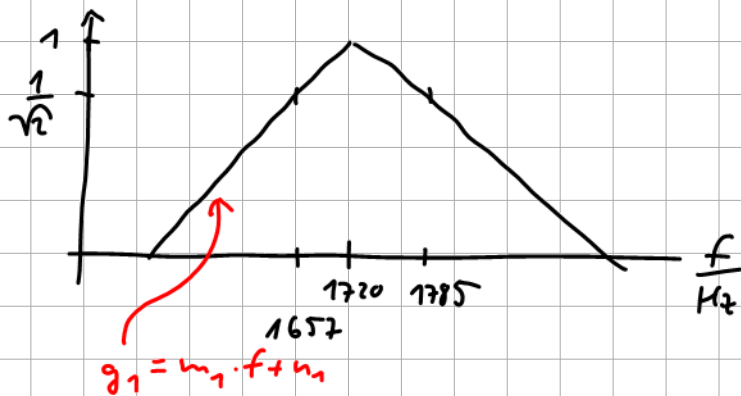
$$2) \quad \frac{3}{2} = \left(2^{\frac{1}{12}}\right)^n \quad (\Leftrightarrow) \quad \frac{3}{2} = 2^{\frac{n}{12}} \quad (\Leftrightarrow) \quad \log_2 \frac{3}{2} = \frac{n}{12}$$

$$(\Rightarrow) \quad n = 12 \cdot \log_2 \frac{3}{2} = 7,02 \approx 7 \text{ Half tones}$$

$$3) f_m = 12 \text{ Barh} = 1,96 \cdot \frac{12 + 0,53}{26,28 - 12} = 1720 \text{ Hz}$$

$$f_{c1} = 11,75 \text{ Barh} = 1657 \text{ Hz}$$

$$f_{c2} = 12,25 \text{ Barh} = 1785 \text{ Hz}$$



$$m_1 = \frac{1 - \frac{1}{\sqrt{2}}}{1720 \text{ Hz} - 1657 \text{ Hz}} = 4,65 \cdot 10^{-3} \frac{1}{\text{Hz}}$$

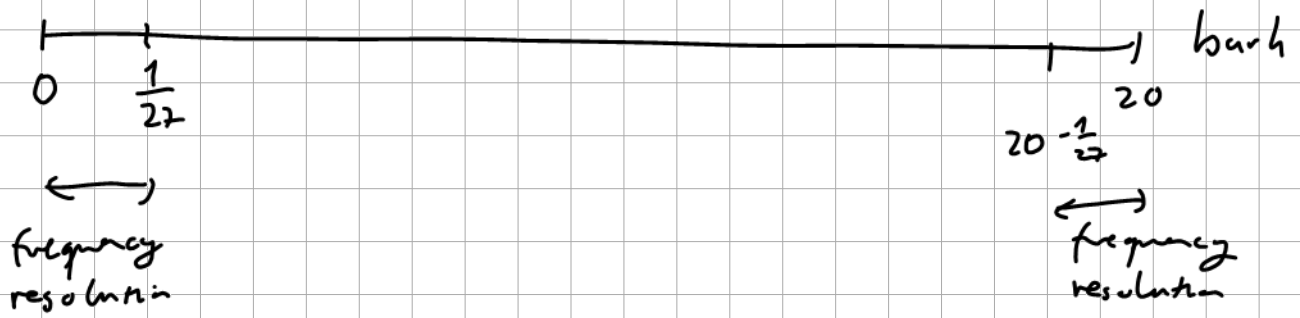
$$1 = 4,65 \cdot 10^{-3} \frac{1}{\text{Hz}} \cdot 1720 \text{ Hz} + n_1 \Leftrightarrow n_1 = 1 - 4,65 \cdot 10^{-3} \cdot 1720 \text{ Hz} = -7,00$$

$$g_1 = 4,65 \cdot 10^{-3} \frac{1}{\text{Hz}} \cdot f - 7,00$$

$$g_1 = 4,65 \cdot 10^{-3} \frac{1}{\text{Hz}} \cdot f_{0,1} - 7,00 \stackrel{!}{=} 0$$

$$f_{0,1} = \frac{7,00}{4,65 \cdot 10^{-3} \frac{1}{\text{Hz}}} = 1505,4 \text{ Hz}$$

4)



$$0 \text{ b} = 39,5 \text{ Hz}$$

$$\frac{1}{27} \text{ b} = 42,4 \text{ Hz}$$

$$\Delta f = 42,4 \text{ Hz} - 39,5 \text{ Hz} = 2,9 \text{ Hz}$$

$$20 \text{ b} \cdot \frac{1}{27} = 6358 \text{ Hz}$$

$$20 \text{ b} = 6407 \text{ Hz}$$

$$\Delta f = 6407 \text{ Hz} - 6358 \text{ Hz} = 39 \text{ Hz}$$











