Define the spectrum

#1: Partials := [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11]

#2: Amplitudes := [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1]

Dissonance function for a pair of sine waves

$$\#3: \quad \text{sfunc}(\text{freq1}, \text{freq2}) := \text{APPROX}\left(\frac{|\text{freq2} - \text{freq1}| \cdot 0.24}{0.0207 \cdot \text{MIN}(\text{freq1}, \text{freq2}) + 18.96}\right)$$

#4: DissSines(freq1, freq2, amp1, amp2) := APPROX(amp1·amp2·(EXP(−
3.51·sfunc(freq1, freq2)) − EXP(− 5.75·sfunc(freq1, freq2))))

Intrinsic Dissonance of a sound

$$\#5: \quad \text{IntrinsicDiss}(\text{freqs}, \text{amps}) := \text{APPROX}\left(0.5 \cdot \sum_{i=1}^{\text{DIM}(\text{amps})} \sum_{j=1}^{\text{DIM}(\text{amps})} \text{DissSines}(\text{freqs}_i, \text{freqs}_j, \text{amps}_i, \text{amps}_j)\right)$$

Dissonance of an Interval

$$\#6: \quad \text{IntervalDiss}(\text{freqs}, \text{amps}, \text{intvl}) := \text{APPROX}\left(\text{IntrinsicDiss}(\text{freqs}, \text{amps}) + \text{IntrinsicDiss}(\text{intvl} \cdot \text{freqs}, \text{amps}) + \sum_{i=1}^{\text{DIM}(\text{freqs})} \sum_{j=1}^{\text{DIM}(\text{freqs})} \text{DissSines}(\text{freqs}_i, \text{intvl} \cdot \text{freqs}_j, \text{amps}_i, \text{amps}_j)\right)$$

Define the Partch Scale

#7: PartchScale := $\left[1, \frac{81}{80}, \frac{33}{32}, \frac{21}{20}, \frac{16}{15}, \frac{12}{11}, \frac{11}{10}, \frac{10}{9}, \frac{9}{8}, \frac{8}{7}, \frac{7}{6}, \frac{32}{27}, \frac{6}{5}, \frac{11}{9}, \frac{5}{4}, \frac{14}{11}, \frac{9}{7}, \frac{21}{16}, \frac{4}{3}, \frac{27}{20}, \frac{11}{8}, \frac{7}{5}, \frac{10}{7}, \frac{16}{11}, \frac{40}{27}, \frac{3}{2}, \frac{32}{21}, \frac{14}{9}, \frac{11}{7}, \frac{8}{5}, \frac{18}{11}, \frac{5}{3}, \frac{27}{16}, \frac{12}{7}, \frac{7}{4}, \frac{16}{9}, \frac{9}{5}, \frac{20}{11}, \frac{11}{6}, \frac{15}{8}, \frac{40}{21}, \frac{64}{33}, \frac{160}{81}, 2\right]$

#8: PlotLine := APPROX(VECTOR([i, IntervalDiss(392·Partials, Amplitudes, i)], i, 1, 3, 0.005))

#9: PartchScalePoints := APPROX(VECTOR($\left[\text{PartchScale}_i, \text{IntervalDiss}(392\cdot\text{Partials}, \text{Amplitudes}, \text{PartchScale}_i)\right]$, i, 1, DIM(PartchScale)))

#10: PartchOtonality := $\left[\frac{4}{4}, \frac{5}{4}, \frac{6}{4}, \frac{7}{4}, \frac{9}{4}, \frac{11}{4}\right]$

#11: PartchOtonalityPoints := APPROX(VECTOR($\left[\text{PartchOtonality}_i, \text{IntervalDiss}(392\cdot\text{Partials}, \text{Amplitudes}, \text{PartchOtonality}_i)\right]$, i, 1, DIM(PartchOtonality)))