

# Lab Waves Solutions

October 20, 2021

## Handwritten Exercises

1. First five partials

- (a) 100Hz, 200Hz, 300Hz, 400Hz, 500Hz
- (b) 550Hz, 1100Hz, 1650Hz, 2200Hz, 2750Hz

2. Intervals

- (a) Different: 300, 600 is an octave. 900, 600 is a fifth.
- (b) Same: 100, 200 is an octave. 200, 400 is an octave.
- (c) Same: 300, 400 is a fourth. 1200, 1600 is a fourth.

3. Wave partials

- (a) **1st partial:** 300Hz, Amp: 1, Phase: 0 — **2nd partial:** 600Hz, Amp: 1/2, Phase 0: — **3rd partial:** 900Hz, Amp: 1/3, Phase: 0 — **4th partial:** 1200Hz, Amp: 1/4, Phase: 0
- (b) **1st partial:** 300Hz, Amp: 1, Phase: 0 — **2nd partial:** 900Hz, Amp: 1/9, Phase: pi — **3rd partial:** 1500Hz, Amp: 1/25, Phase: 0 — **4th partial:** 1800Hz, Amp: 1/49, Phase: pi
- (c) **1st partial:** 300Hz, Amp: 1, Phase: 0 — **2nd partial:** 900Hz, Amp: 1/3, Phase: 0 — **3rd partial:** 1500Hz, Amp: 1/5, Phase: 0 — **4th partial:** 1800Hz, Amp: 1/7, Phase: 0

4.  $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{1}{\sqrt{n}} A \sin(2\pi fnt)$