

# Physics 23 Problem Set 4

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Due Monday, October 22

Please make your work neat, clear, and easy to follow. It is hard to grade sloppy work accurately. Generally, make a clear diagram, and label quantities. Derive symbolic answers, and then plug in numbers after a symbolic answer is available.

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1. A guitar string of length  $L$  is stretched initially into the shape  $y(x, 0) = (2a/L)x$  for  $x < L/2$  and  $y(x, 0) = (2a/L)(L - x)$  for  $x > L/2$ , and then released from rest.
    - (a) Plot  $y(x, 0)$ .
    - (b) Find the Fourier series that describes the initial condition of the string. Are there values of  $n$  for which the Fourier coefficients  $B_n$  are zero?
    - (c) Include only the first two non-zero terms in the series, and compute and plot the string at three times:  $t = 0$ ,  $t = 0.3L/v$ , and  $t = 0.6L/v$ , where  $v$  is the speed of sound on the string.
  2. 16.4
  3. 16.8
  4. 16.18
  5. 16.24
  6. 16.48
  7. 16.58
  8. 16.72
  9. 16.76
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