Homework 4

ME 240: Fundamentals of Instrumentation & Measurement
D. H. Kelley and I. Mohammad • 16 points

1. A sinusoidal signal with frequency f_1 is sampled with rate f_s. Determine the lowest alias frequency if

   (a) (2 points) $f_1 = 60$ Hz and $f_s = 90$ Hz
   (b) (2 points) $f_1 = 1.2$ kHz and $f_s = 2$ kHz
   (c) (2 points) $f_1 = 10$ Hz and $f_s = 6$ Hz
   (d) (2 points) $f_1 = 16$ Hz and $f_s = 8$ Hz
   (e) (2 points) $f_1 = 3.5$ kHz and $f_s = 2$ kHz

2. The function $f(t) = 3\cos 500\pi t + 5\cos 800\pi t$ (where t is in seconds) is sampled at 400 samples per second starting at $t = 0.00025$ s.

   (a) (3 points) What false alias frequencies would you expect in the output?
   (b) (3 points) What minimum sampling rate would be required to avoid false frequencies?