This homework can be completed either individually or in pairs. Please clearly and neatly write the name(s) of the people doing the assignment in the top right corner of the top page turned of your submission. (If done in pairs, only one submission is needed.)

1. Use MATLAB to plot the signal \( g(t) = \sin(200\pi t) \) on the interval \(-0.25 < t < 0.5\). Clearly label the horizontal and vertical axes in your figure. What is the independent variable in this problem? What is the dependent variable? How did you decide how many samples of “t” were “enough” to get an accurate picture of the signal?

2. Use MATLAB to plot the signal \( x(t) = \sum_{n=0}^{N} \frac{1}{1+n} \cos(3\pi nt + \frac{\pi}{5}) \) on the interval \(-1 < t < 0\) for \(N=5\). Label the axes, and discuss how you to decide how many samples to use for “t.”

3. Repeat Problem 3 using \(N=100\).

Determine if the following signals are periodic or nonperiodic. If periodic, find the fundamental period.

4. \( x(t) = \cos(20\pi t + \pi / 3) \)

5. \( y(t) = \cos(20\pi t + \pi / 3) - 3\sin(25t) \)

Find the total average power in the following signals.

6. \( x(t) = 5\cos(20\pi t + \pi / 3) \)

7. \( x(t) = \cos(2\pi t) - j2\sin(3\pi t) \)

8. \( x(t) = 3\cos(2\pi t) - j3\sin(2\pi t) \)

9. \( x(t) = 5\cos^2(20\pi t + \pi / 3) \)

Find the frequencies at which the following signals have nonzero power.

10. \( x(t) = \cos^2(20\pi t) \)

11. \( x(t) = \cos(20\pi t)\sin(30\pi t) \)

12. \( x(t) = \cos(20\pi t + \frac{\pi}{3})\sin(30\pi t) \)