**Problem 4.1**

**a) Sketch the two-sided spectrum of this signal. Label all complex amplitudes in polar form**

**b) Determine the fundamental frequency (in Hz) and the fundamental period (in secs. Of this signal.**

**Problem 4.2**

**a) What is the fundamental frequency of x(t)?**

**b) A periodic signal may be expanded in a Fourier series expansion as . Find the Fourier series coefficients ak for the signal above.**

**c) Plot the coefficients ak versus k. Note that you should be able to do this without evaluating any integrals**

**Problem 4.3**

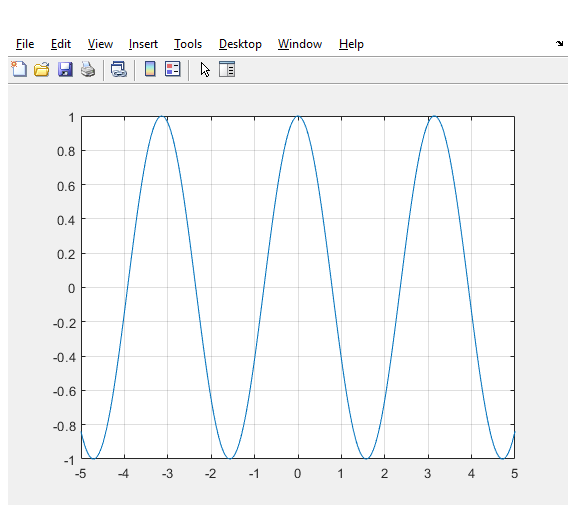
**a) In the expression for ak in Equation (1) above, the integral and its limits define the signal x(t). Determine an equation for x(t) that is valid over one period.**

**b) Using your result from part (a), draw a plot 9f x(t) over the range -12 <= t <= 12 seconds. Label it carefully.**

**c) Determine a0, the DC value of x(t).**

**Problem 4.4**

**a) Sketch the periodic function x(t) for -5 <= t <= 5**

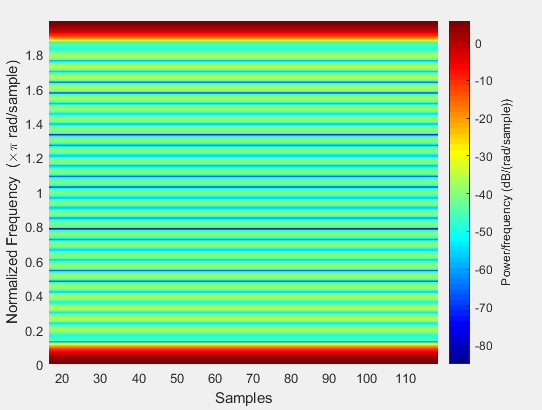


**b) Determine a0, the DC coefficient for the Fourier series.**

**c) Set up the Fourier analysis integral for determining ak for k != 0**

**d) Evaluate the integral in part (c) and obtain an expression for ak that is valid for all k != 0**

**e) Make a plot of the spectrum over the range -3f0 <= f <= 3f0 where f0 is the fundamental frequency of the signal.**

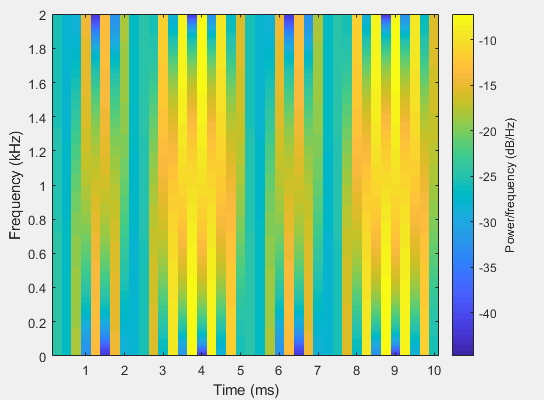
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**Problem 4.5**

**a) Use Euler’s formulas for the cosine functions to expand x(t) in terms of complex exponential signals so that you can sketch the two-sided spectrum of the signal. Is the waveform periodic? What is the period?**

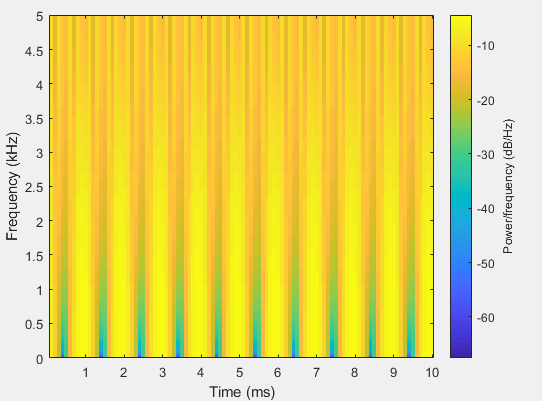
**b) What is the minimum sampling rate fs that can be used in the above system so that y(t) = x(t)?**

**c) Plot the spectrum of the sampled signal x[n] for the case when fs = 4000.**

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**Problem 4.6**

**a) Draw the spectrum @ fsi = 10000 samples/sec**

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