

Fourier Series Exercises

The **due date** for this homework is **Sun 14 Apr 2013 8:00 PM EDT**.

Question 1

The signal $\cos(2\pi t)$ is, of course periodic. What is its period? Enter a numeric value.

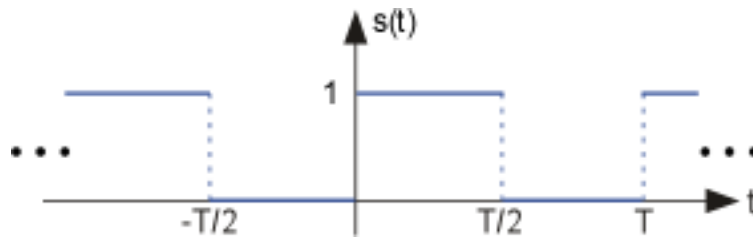
Question 2

What are the Fourier series coefficients c_0 , c_1 , c_2 for $\cos(2\pi t)$ *without* explicitly calculating integrals. Use Euler's formula, Fourier series properties and any appropriate mathematical "tricks."

Express your answer numerically, typing the real and imaginary parts for each answer separated by spaces. So, an answer of $c_0 = 0$, $c_1 = 1 + j$, $c_2 = -j$, $c_3 = 0$ would be typed as 0 0 1 1 0 -1 0 0.

Question 3

What are the Fourier series coefficients c_0 , c_1 , c_2 for the depicted waveform?

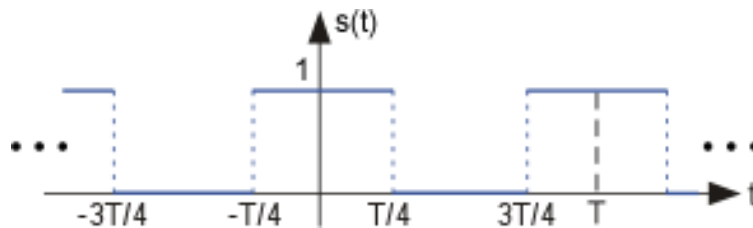


You could evaluate the coefficients by evaluating the integral, but there is a simpler way. See if you can figure out the simple approach.

Express your answer numerically, typing the real and imaginary parts for each answer separated by spaces. So, an answer of $c_0 = 0$, $c_1 = 1 + j$, $c_2 = -j$, $c_3 = 0$ would be typed as 0 0 1 1 0 -1 0 0.

Question 4

What are the Fourier series coefficients c_0 , c_1 , c_2 for the depicted waveform?

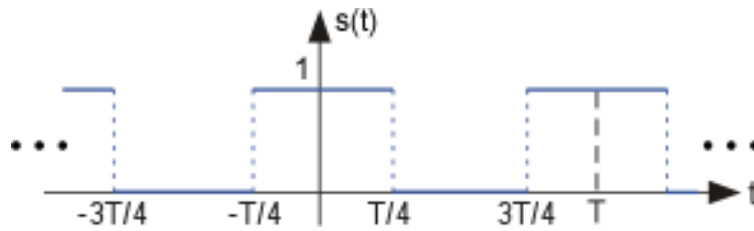


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Question 5

What kind of signal is this? Select all the properties that this signal possesses.



- ☐ Periodic
- ☐ Odd symmetry
- ☐ Even symmetry
- ☐ A superposition of pulses having width $T/2$.

Question 6

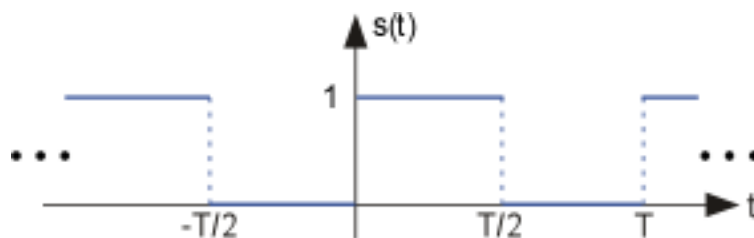
A square wave of period T and amplitude 1 serves as the input to an RC lowpass filter. What are the Fourier series coefficients for the filter's output? Since the square wave consists only of odd harmonics, enter your answer for the output's Fourier series coefficients d_k , k odd, as an expression involving T , R and C .

$d_k = ?$, k odd.

Preview

Question 7

Suppose the following waveform serves as the input to our RC lowpass filter.



How does the Fourier series coefficients for the output compare to those when a

square-wave was the input? Select *all* that apply.

- ☐ The values for the coefficients for $k \geq 1$ are half the value of those resulting from the square-wave input.
- ☐ The values for the coefficients for $k \geq 1$ are unchanged.
- ☐ The two are the same.
- ☐ d_0 is now non-zero and equals $1/2$.

- ☐ In accordance with the Honor Code, I certify that my answers here are my own work.

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