Complex Systems Boot Camp

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1) What is the amplitude, frequency, period and phase of the following harmonic function?

   $f(x) = 2\sin(3\,x + \frac{\pi}{2})$ $A =$ $\omega =$ $T =$ $\varphi =$

2) Convert $f(x) = 2\sin(3\,x + \frac{\pi}{2})$ into the sum of a sine and cosine function.

3) Find the amplitude, period and phase of the following harmonic function.

   $g(x) = 2\cos 2\,x + 2\sqrt{3}\sin 2\,x$ $A =$ $T =$ $\varphi =$

4) Find the Fourier expansion of $h(x) = x$ with $-\pi < x < \pi$,   and $h(x + 2\pi) = h(x)$

5) Explain why there are no cosine terms in the answer to question 4.

6) Use Taylor's formula to find the first five terms of the Maclaurian series for: $f(x) = e^{-2x}$

7) At what decimal point do you notice the first error in the function at the following points:

   $f(1.2) =$ $f(-\frac{1}{2}) =$ $f(0) =$

   Use the series and compare your answers with those obtained from a calculator.

8) Without using the Taylor's formula find the first four terms of the Maclaurian series for:

   $f(x) = -2e^{-2x}$ (Hint: Modify the series used in problem 6)

9) Find the series formed by differentiating each term of the answer to problem 6.

10) Explain why the problems 8 and 9 have the same result.