3. Lecture 3

The following can be done after Lecture 3.

3-1

10.0/10.0 points (graded)

For which positive numbers ω does

$$\ddot{x} + \omega^2 x = \mathrm{Sq}\,(t)$$

have a periodic solution?

- ◯ All positive numbers.
- ◯ No positive numbers.
- ◯ All positive integers.
- ◯ All positive even integers.
- ◯ All positive odd integers.

- ◯ All positive numbers that are not integers.
- ◯ All positive numbers that are not even integers.
- ◉ All positive numbers that are not odd integers. ✔

Submit You have used 2 of 3 attempts

3-2

10/10 points (graded)

For which positive numbers ω does

$$\ddot{x} + 2\dot{x} + \omega^2 x = \mathrm{Sq}\,(t)$$

have a periodic solution?

- ◉ All positive numbers.
- ◯ No positive numbers.
- ◯ All positive integers.
- ◯ All positive even integers.
- ◯ All positive odd integers.

- ◯ All positive numbers that are not integers.
- ◯ All positive numbers that are not even integers.
- ◯ All positive numbers that are not odd integers.

✔

Submit You have used 1 of 3 attempts

✔ Correct (10/10 points)

3-3

15/15 points (graded)

Let $\mathrm{Sq}(t)$ be the odd periodic function of period 2π such that $\mathrm{Sq}(t) = 1$ for $0 < t < \pi$. Let $x(t)$ be the steady-state solution (i.e., periodic solution) to

$$\ddot{x} + \dot{x} + 8x = \mathrm{Sq}(t).$$

What is the coefficient of $\cos 3t$ in the Fourier series of $x(t)$?

Note: You must use a star to denote multiplication; e.g. $7 * x = 7x$. Use $\wedge$ to denote exponentiation; e.g. $e \wedge x = e^x$. A slash denotes division; e.g. $1/2 = 0.5$. Please type pi rather than a numerical approximation for π.

-2/(5*pi) ✔

$-\frac{2}{5 \cdot \pi}$

FORMULA INPUT HELP

Submit You have used 2 of 10 attempts

✔ Correct (15/15 points)

3-4

5/5 points (graded)

When a cellist plays an open string note on the A string (220 Hz), which of the following are present among the overtones? (A cello note is rich enough that it contains all physically possible overtones among those in the list below.)

- [ ] (a) 275 Hz (C♯ a major third above)
- [ ] (b) 330 Hz (E a perfect fifth above)
- [x] (c) 440 Hz (A an octave above)
- [ ] (d) 550 Hz (C♯ an octave plus a major third above)
- [x] (e) 660 Hz (E an octave plus a perfect fifth above)
- [x] (f) 880 Hz (A two octaves above)
- [x] (g) 1100 Hz (C♯ two octaves plus a major third above)

✔

Solution:

The answers are (c), (e), (f), (g).

The frequencies present are those that are a positive integer times the fundamental frequency of 220 Hz: these include 440 Hz, 660 Hz, 880 Hz, 1100 Hz, but not the others.

Submit You have used 2 of 5 attempts

Answers are displayed within the problem

3. Lecture 3

Topic: Unit 1: Fourier Series / 3. Lecture 3

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Please explain In the discussion and presentation of ideas re: square wave, I have seen that it is the series 4/pi * sum sin (n*pi*t)/n but I always get confused because I don't see where the 4...	4
Struggling with 3-3	10
Why did we use the imaginary part and not the real part of cos3t? I got the answer correct from discussion below but I was confused y did we use imaginary part for cos3t and not real part? I tried putting in real part as solution and it gave m...	3
Confused about 3-3 I don't really get why my solution is wrong for 3-3, as I looked at the steps in the worked example for lecture 3 and I can't identify my mistake. Could somebody provide a sugg...	3
Entered the right answer and it was marked wrong. On my second-last attempt I entered the answer given by the solution and my answer was still marked wrong, which led to me getting the question wrong. I know this becaus...	3
3-3 I'm 100% that the solution I got is right. But it keeps saying that is incorrect. What could be wrong with my answer? Any help?	10
The whole page isn't rendering I may have to come back to this later. Nothing on this page is rendering now and going back and forth between pages isn't helping. Maybe I'll try Chrome rather than Firefox a... Community TA	3