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1. Lecture 1

The following can be done after Lecture 1.

1-1

5/5 points (graded)

Recall that a function f(t) is called periodic of period P if f(t+P)=f(t) for all t. True or false: The function $\cos 5t$ is periodic of period 2π .







Solution:

True, because

$$\cos\left(5\left(t+2\pi\right)\right)=\cos\left(5t+10\pi\right)=\cos 5t,$$

since 10π is an integer times 2π . (The **smallest** period of $\cos 5t$ is $2\pi/5$, but that is not what this problem is asking about.)

Submit

You have used 1 of 1 attempt

• Answers are displayed within the problem

1-2

5/5 points (graded)
The function $\sin^2 t$ is

- even but not odd.
- odd but not even.
- both even and odd.
- neither even nor odd.



Solution:

Even but not odd. It is even because $\sin^2(-t) = (-\sin t)^2 = \sin^2 t$. It is not odd, since $\sin^2(-t) = -\sin^2 t$ is not true for **all** t (for example, it fails when $t = \pi/2$).

Submit

You have used 1 of 2 attempts

• Answers are displayed within the problem

1-3

10/10 points (graded)

Let f(t) be the function of period 2π such that

$$f(t) = egin{cases} 0 & ext{for } -\pi < t \leq 0; \ 3 & ext{for } 0 < t \leq \pi \end{cases}.$$

What is the value of the constant coefficient in the Fourier series of f?

3/2 Answer: 3/2 $\frac{3}{2}$

Solution:

The constant term is $\frac{a_0}{2}$, where

$$a_0 = rac{1}{\pi} \int_{-\pi}^{\pi} f(t) \; dt = rac{1}{\pi} igg(\int_{-\pi}^{0} 0 \, dt + \int_{0}^{\pi} 3 \, dt igg) = rac{1}{\pi} \int_{0}^{\pi} 3 \, dt = 3.$$

Therefore the constant term is $\frac{a_0}{2} = \frac{3}{2}$.

Alternative solution: The answer is the average value of f(t) on one period, which is 3/2, the average of 0 and 3, because the interval on which f(t)=0 has the same length as the interval on which f(t)=3.

1 Answers are displayed within the problem 1-4 5/5 points (graded) Let f(t) be the periodic function of period 2π such that f(t) = |t| for $-\pi \le t < \pi$. What is the coefficient of $\sin 7t$ in the Fourier series for f? 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 . 0 ✓ Answer: 0 Solution: The answer is 0, because f(t) is an even function. You have used 1 of 10 attempts Submit **1** Answers are displayed within the problem 1. Lecture 1 **Hide Discussion** Topic: Unit 1: Fourier Series / 1. Lecture 1 Add a Post Show all posts ▼ by recent activity ▼ 2 Since the 'a' coefficients are a sub n, isn't the constant coefficient a sub 0? Learn About Verified Certificates © All Rights