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.

- (•) True
- ( ) False

✔

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 $\sin^2\left(-t\right)=\left(-\sin t\right)^2=\sin^2 t$. It is not odd, since $\sin^2\left(-t\right)=-\sin^2 t$ 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

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

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

$$a_0 = \frac{1}{\pi}\int_{-\pi}^{\pi} f(t)\,dt = \frac{1}{\pi}\left(\int_{-\pi}^{0} 0\,dt + \int_{0}^{\pi} 3\,dt\right) = \frac{1}{\pi}\int_{0}^{\pi} 3\,dt = 3.$$

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 $f(t) = 3$.

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You have used 1 of 10 attempts

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 $-\pi \leq t < \pi$. 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

0

Solution:

The answer is 0, because $f(t)$ is an even function.

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You have used 1 of 10 attempts

Answers are displayed within the problem

1. Lecture 1

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[staff] terminology in 1-3

Since the 'a' coefficients are a sub n, isn't the constant coefficient a sub 0?

2

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