

1. Practice with Fourier series and

Course > Unit 1: Fourier Series > Recitation 3 > ODEs

1. Practice with Fourier series and ODEs

Find the smallest period

1/1 point (graded)

Find the Fourier series for $f(t) = |\sin(t)|$.

What is the **smallest** period for f(t)?



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Find the form of the Fourier series

1/1 point (graded)

Based on the period you found in the previous problem, the general form of the Fourier series of $f(t) = |\sin{(t)}|$ is

	∞
a_0 .	
_ +	$\sum_{n=1}^{\infty}a_{n}\cos\left(\omega_{n}t ight)+b_{n}\sin\left(\omega_{n}t ight)$
2	$\overline{n=1}$

where
$$\omega_n = oxed{2^* n}$$

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Use symmetry

1/1 point (graded)

Which coefficients of the Fourier series for $f(t)=|\sin{(t)}|$ must be zero based on the symmetry of f(t)? (Check all that apply.)

 $igcap a_0/2$

 $igcap a_n$, $n\geq 1$



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3/3 points (graded)



$$a_n = \boxed{ ext{(4/pi)*(1/(1-4*n^2))}}$$

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✓ Correct (3/3 points)

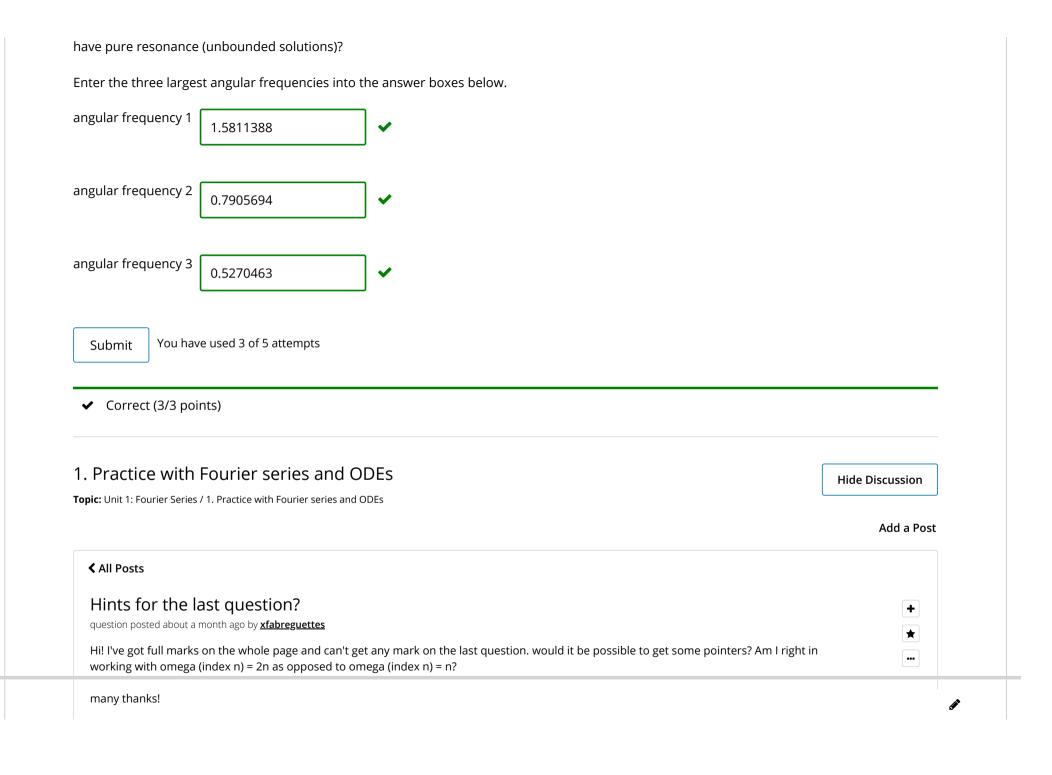
You can check your work on the problem above by instead computing the Fourier coefficients for the function as having period 2π rather than period π .

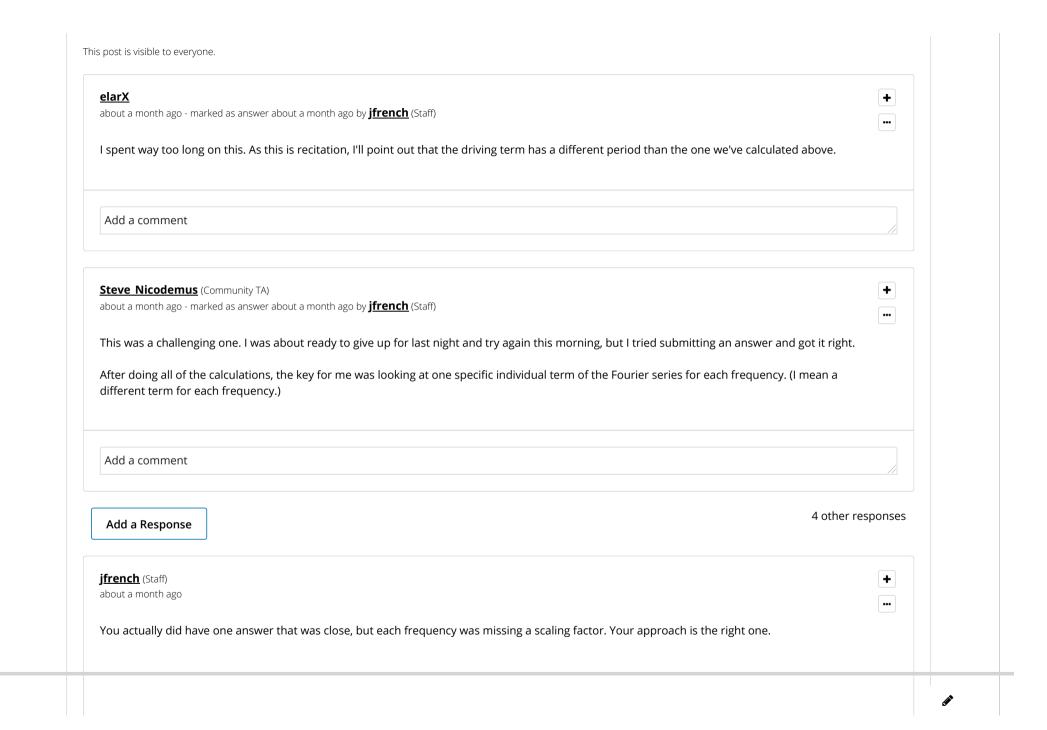
Pure resonance

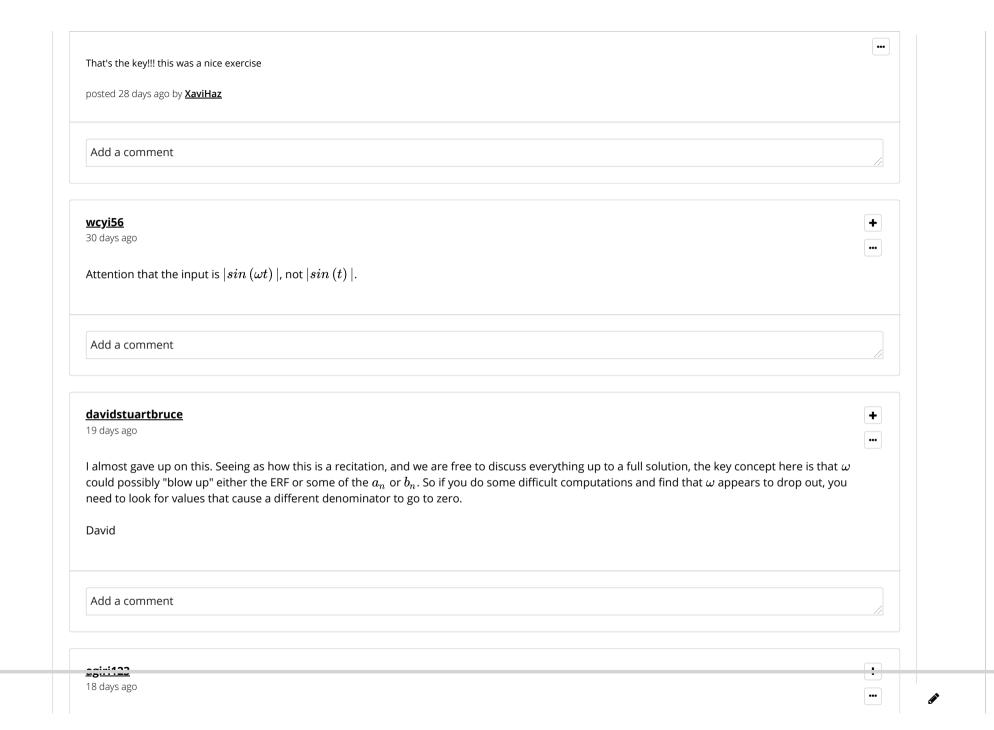
3/3 points (graded)

For which values of ω does the system

$$10\ddot{x} + 100x = |\sin \omega t|$$







I am afraid all the comments above were a bit too mysterious for me. Here is how i solved it. Hopefully this helps someone else too: Look at Unit 1 -> 3. Solving ODEs with Fourier Series and Signal Processing -> 7. Same example, but with period 2L This gives the form of solution for equations of type $y'' + \omega_0^2 y = f(t)$. Remember the following: 1) f(t) is $|sin(\omega t)|$. So use the solutions from earlier parts for |sin(t)| but do not forget to scale ω_n appropriately. 2) You will see that the terms of the solution $x_n(t)$ depend on both ω_n and ω_0 . Note that ω_0 is a constant based on the problem statement. 3) Compute values of ω_n that cause resonance. My problem was that I expected integers in the answer. posted 17 days ago by anton melnikov I am still struggling at this last moment. My understanding was that omega n was function of n and omega. (2*n*omega). As n is integer and omega is just any real number, we can find infinite combinations of n and omega which makes omega_n = omega_0 and create resonance. How we can find top three? posted 15 days ago by **SumiArima** Add a comment Showing all responses Add a response:

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