PH300 Spring 2011

Homework 01

Total: 15 Points

1. (0.5 Points) What percentage of the course score is determined by participation, homework, & exams?

2. (0.5 Points) When and where are the weekly problem-solving sessions?

3. (1 Point) If \( z = \frac{a}{b} \exp(bt) \), where \( a \) and \( b \) are not functions of \( t \), then \( \frac{dz}{dt} = ? \)

4. (1 Point) If \( z = \sin \left( \frac{\pi}{L} x \right) \cos \left( \frac{\pi}{L} x \right) \), then the ABSOLUTE VALUE OF \( \int_{-\frac{L}{2}}^{0} z \, dx = ? \)

5. (0.5 Points) What is the most general solution to the following differential equation? (\( k \) is a real constant.)

\[ y''(x) = -k^2 \cdot y(x) \]

6. (0.5 Points) What is the most general solution to the following differential equation? (\( k \) is a real constant.)

\[ y''(x) = +k^2 \cdot y(x) \]

7. (1 Point) Rewrite the two expressions \( \cos(kx) \) and \( \sin(kx) \) in terms of complex exponentials.

8. (0.5 Points) What is the real part of the expression \( \exp(ikx) \)? (\( k \) and \( x \) are real.)
9. (4.5 Points, 1.5 points each) Show which of the following possible functional forms work or do not work as solutions to this differential equation (explaining how you know the solution works or not).

\[ \frac{\partial^2 E}{\partial x^2} = \frac{1}{c^2} \frac{\partial^2 E}{\partial t^2} \]

\[ E(x,t) = A \cos(Bt) \]

\[ E(x,t) = Ax^2t^2 \]

\[ E(x,t) = A \cos(Bx + Ct) \]

For the one(s) that will work as a solution, figure out what constraints, if any, there are on the values of the constants A,B,C.

10. (5 Points) Complete the online survey at: http://tinyurl.com/PH300SP11PRE

This survey is about expressing your own beliefs and opinions, and so there are no “right” or “wrong” answers here. Full credit will be given to students who submit thoughtful responses, regardless of the actual content of your response.