

QUIZ #28, 12/4/07

MATH 54, FALL 2007

Show your work and justify your answers! Feel free to use both sides.

Name:

1. (8pts) (a) Find the general solution to

$$\begin{aligned} (1) \quad & \frac{\partial u}{\partial t} = 9 \frac{\partial^2 u}{\partial x^2} \\ (2) \quad & u(0, t) = 0 \\ (3) \quad & u(\pi, t) = 0. \end{aligned}$$

[Note: You may give a brief summary of what's going on instead of showing all your work if you prefer. If you show more work, you'll be eligible for more partial credit, however.]

(b) If we impose the initial condition $u(x, 0) = \sin x + 5 \sin 3x$, what is the (specific) solution?

2. (2pts) Suppose I have

- (A) a string, tied down at both ends [i.e. its position at each end is kept at zero], whose height as a function of position and time I'm studying **and**
- (B) a metal rod with a heat sink at both ends [i.e. its heat is kept at zero at each end] whose heat as a function of position and time I'm studying.

For each of (A) and (B) tell me whether I need to know

- (I) just the height/heat as a function of position for $t = 0$ **or**
- (II) both the height/heat as a function of position for $t = 0$ and the rate of change of height/heat as a function of position for $t = 0$

in order to know the height/heat for all (future) times.