NAME (please print):

Quiz 1 (Sample)

1. Circle the heat equation(s):

- $u_{tt} = 2u_{xx}$,
- $u_t = 3u_{xx} + 5x$,
- $2u_t = 3u_{xx}$,
- $u_t = -2u_x$.

2. Write the Initial Boundary Value problem modeling heat transfer in a rod of length L, with thermal diffusivity $k = 3$, thermal conductivity $k_0 = 2$, initial rod temperature equal to zero, and prescribed heat flux at the rod's left end point $x = 0$ given by 2, and heat flux at the rod's right end point $x = L$ given by $2t$.

3. Write a mathematical formula (definition) for the total energy of a rod of length L with constant density and constant specific heat.

4. (a) How many pieces of initial data do we need to prescribe for the following partial differential equations:

- $u_t = k\ u_{xx}, \quad x \in (0, L), t > 0,$
- $u_{tt} = 3x\ u_{xx}, \quad x \in R, t > 0.$

(b) List three different types of boundary data for the heat equation that can be prescribed at the end points?

5. (a) Verify that the function

$$f(x, t) = a \sin(3\pi x) e^{-2t}, \quad a > 0,$$

satisfies the following heat equation:

$$u_t = \frac{2}{9\pi^2} u_{xx}, \quad x \in (0, L), t > 0,$$

(b) What is the initial condition satisfied by f?

(Feel free to use back of the paper to write the solution(s).)