

Midterm 1

Math 3435-2, Spring 2019, UConn

Date: 02/27/2019, Wednesday

Duration: 1h

Instructions:

- No calculator is allowed.
- Unless it is indicated in the questions that only a final answer is required, you need to show your work to get credit.
- If you have work on the back of a page, please indicate this on the front of the page.

Name: _____

Husky Card ID: _____

Question	Points	Score
1	10	
2	10	
3	10	
4	10	
Total	40	

Question 1. Solve $u_x - u_y + u = e^{x+y}$ with $u(x, 0) = 0$ by the method of characteristic curves.

Question 2. Solve $u_{xx} - u_{xt} - 2u_{tt} = 0$, $u(x, 0) = x$, $u_t(x, 0) = e^x$. (Hint: Factor the operator as we did for the wave equation.)

Question 3. Suppose u_1 and u_2 are both solutions to the wave equation $u_{tt} - c^2 u_{xx} = 0$ satisfying the initial conditions $u(x, 0) = \phi(x) \in C^2$, $u_t(x, 0) = \psi(x) \in C^1$. Here $-\infty < x < \infty$, $-\infty < t < \infty$. Using the energy for the wave equation, show that $u_1(x, t) = u_2(x, t)$ for all x and t .

Question 4. Write down a solution formula to the heat equation $u_t - ku_{xx} = 0$ satisfying the initial condition $u(x, 0) = \phi(x)$ where $\phi(x) = A$ for $x < 0$ and $\phi(x) = B$ for $x > 0$. Here A and B are two constants. Then evaluate $\lim_{t \rightarrow \infty} u(x, t)$ for each x . No justification is needed for this question.