

Math 3209 - Fall 2020
Partial Differential Equations - Individual Homework i2

Easy point problems :-)

1. Include pictures of your notes from the video lectures from week 2. You will get credit just for submitting these.

Problems for video lecture V5: Variable Coefficient 1st order PDEs

2. Suppose that $u = u(x, y)$ satisfies the PDE

$$xu_x + yu_y = 0 \tag{1}$$

and that $u(1, 1) = 3$ and $u(1, 2) = 4$. For the following statements pick a response of “definitely true”, “definitely false”, or “might be true”. Justify your responses.

- (a) $u(2, 2) = 3$
 - (b) $u(2, 3) = 3$
 - (c) $u(2, 4) = 3$
3. Problem 6 in Sec. 1.2

Problems for video lecture V6: Coordinate Method

4. Suppose $\tilde{x} = ax + by$ and $\tilde{y} = bx - ay$. Perform a calculation that confirms that \tilde{x} and \tilde{y} are orthogonal.
5. Suppose $\tilde{x} = ax + by$ and $\tilde{y} = bx - ay$. Demonstrate that the \tilde{x} axis is parallel to the vector $\vec{v} = \langle a, b \rangle$
6. To derive the coordinate method, we needed to use the chain rule from multivariate calculus. We will use the chain rule often in this class, so it is good to make sure we know it well. Let’s do some practice. Suppose $u(\tilde{x}, \tilde{y}) = \sin(\tilde{x}) + \tilde{y}^2$ and that $\tilde{x} = x + y$ and $\tilde{y} = x - y$. Compute u_y .

Problems for video lecture V7: Coordinate Method (part 2)

7. Problem 8 in Sec. 1.2.

Problems for video lecture V8: Summary of first order PDE methods

8. Consider the two figures below. Which panel (a) or (b) corresponds to the solution of $u_x + 2u_y = 0$
9. Consider the two figures below. Which panel (a) or (b) corresponds to the solution of $u_x + 2xy^2u_y = 0$

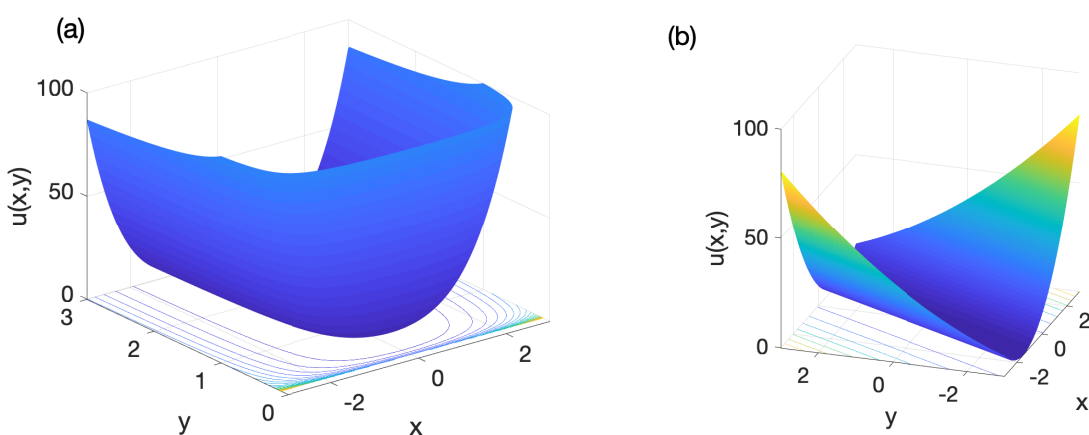


Figure 1: Figures for problem 8 and 9