**Partial differential equations**

**Homework**

**Task 3. Classification of partial differential equations**

**Methodical instructions**

In Lecture 3, we considered the classification of second order partial differential equations with two independent variables



It is necessary to determine the type of the given equation and to reduce it the canonic form using the transformation to the new variables



**Variants**

|  |  |
| --- | --- |
| variant | equation |
| 1 |  |
| 2 |  |
| 3 |  |

**Actions**

It is necessary perform the following steps:

1. Calculate the value of the discriminant *D.*
2. Using the sign of *D* determine the sets of the plane *xy*, where the equation has the concrete type.
3. For the hyperbolic case, write two characteristic equations.
4. Find its general solutions.
5. Write these general solutions in the form  and .
6. Determine the new variables  
7. Calculate the coefficients of the equation in the new variables by the given formulas.
8. Determine the canonic form of the given equation for the hyperbolic case.
9. For parabolic case, consider the unique characteristic equation, determine variable  by previous method with arbitrary variable *η*, and repeat the actions of hyperbolic case.
10. For elliptic case, consider the first characteristic equation with complex parameters, find its general solution, write it is the form , choose the functions *ξ* and *η* as new variables, and repeat the actions of hyperbolic case.