

**Test 3**

(Take-home)

due to November 3, 4 points in 1 problems

**Name and the student number:**

**Q1. (4 pts)** *Vector field  $V$  is the gradient of function  $f(x, y) = xy$ , and  $W$  is defined by the differential equations*

$$\dot{x} = y$$

$$\dot{y} = -x$$

- (1) *What is geometrical meaning of these vector fields according to the nature of their definition ?*
- (2) *Present the fields in the form  $P(x, y) \frac{\partial}{\partial x} + Q(x, y) \frac{\partial}{\partial y}$ .*
- (3) *Find the Lie bracket  $[V, W]$  in a similar form. Do these vector field commute ?*
- (4) *Determine if these fields determine a symplectic flow.*