Midterm 1, Theoretical questions

November 10, 41 points in 5 questions

Name and the student number:

Q1. (16 pts)

- (1) What is called "a symplectic linear form" in \mathbb{R}^{2n} ?
- (2) Give a formula for the standard symplectic form in \mathbb{R}^{2n} .
- (3) Give a formula relating the inner product, the complex structure and the symplectic form in \mathbb{R}^{2n} .
- (4) Give a formula relating the Hermitian form in \mathbb{C}^n with the inner product and the symplectic form.
- (5) What does say the Darboux theorem ?
- (6) Formulate Cartan's formula.
- (7) What is a contact form ?
- (8) What is Reeb's vector field ?

Q2. (5 pts) Define the tautological and canonical forms on the cotangent bundle.

Q3. (5 pts) State the Liouville Theorem. Derive it from Cartan's formula.

Q4. (5 pts) Describe the symplectization of a contact manifold and contactization of a symplectic manifold.

Q5. (10 pts) Give definitions of (a) strongly and (b) weakly fillable contact manifold. (State two equivalent conditions for each of the definitions).