Question 5 [12 marks]:

Let p, q and r be propositions. Prove or disprove that $p \wedge (q \equiv r) \equiv ((p \wedge q) \equiv (p \wedge r))$.

p	q	r	q ≡ r	p∧ (q ≡ r)	p∧q	p∧r	(p∧q) ≡ (p∧r)	p∧ (q ≡ r) ≡ ((p∧q) ≡ (p∧r))
T	T	T	T	T	T	T	T	T
T	T	F	F	F	T	F	F	T
T	F	T	F	F	F	T	F	T
T	F	F	T	T	F	F	T	T
F	T	T	T	F	F	F	T	F
F	T	F	F	F	F	F	T	F
F	F	T	F	F	F	F	T	F
F	F	F	T	F	F	F	T	F

Since the last column is not all true, p∧ (q ≡ r) ≡ ((p∧q) ≡ (p∧r)) is not valid.