School of Mathematics and Physics, UQ

MATH1081 Advanced Discrete Mathematics
Semester 1 2025
Problem Set 3

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Tutorial Group #3
Due 5pm Friday 23 May 2025

Question 1: 15 marks

Let S be some set, and let ρ be some equivalence relation on S.

(a) Define a new relation ρ on S for which $x\rho y$ if and only if $\exists z \in S : x\rho y,\ y\rho x$. Prove that yz . Prove that = .

(b) Let T be some set, and let f : S → T be a one-to-one function. Define a relation on T whereby, for all a, b T , ab if and only if x, y S such that xy , f (x) = a, and f (y) = b. Is it always true that must be an equivalence relation? Either prove that it is, or provide a counterexample. (c) Let T be some set, and let g : S → T be an onto function. Define a relation on T whereby, for all a, b T , ab if and only if x, y S such that xy , g(x) = a, and g(y) = b. Is it always true that must be an equivalence relation? Either prove that it is, or provide a counterexample.

Solution:

Question 2: 20 marks

Solution:

Question 3: 15 marks

Solution: