

MTH 3105 DISCRETE MATHS

ASSIGNMENT 1

DUE: 6TH DEC 2011

1. a) Let R_1 and R_2 be the "congruent modulo 3" and the "congruent modulo 4" relations, respectively, on the set of integers. That is, $R_1 = \{(a, b) \mid a = b \pmod{3}\}$ and $R_2 = \{(a, b) \mid a = b \pmod{4}\}$. Find
 - i) $R_1 \cup R_2$.
 - ii) $R_1 \cap R_2$.
 - iii) $R_1 - R_2$.
 - iv) $R_2 - R_1$.
 - v) $R_1 \oplus R_2$.
- b) What are the equivalence classes for R_1 and R_2 ?
2. Find the inverses of the following functions mapping \mathbb{R} to \mathbb{R}
 - a) $f(x) = 2x + 3$
 - b) $h(x) = (x - 2)^3$
3. Let $S = \{1, 2, 3, 4, 5\}$ and $T = \{a, b, c, d\}$. For each question below: if the answer is YES give an example; if the answer is NO, explain briefly.
 - a) Are there any one-to-one functions from S into T ?
 - b) Are there any one-to-one functions from T into S ?
 - c) Are there any functions mapping T onto S ?
 - d) Are there any one-to-one correspondences between S and T ?
4. Let $f: S \rightarrow T$ and $g: T \rightarrow U$ be invertible functions. Show that $g \circ f$ is invertible and that $(g \circ f)^{-1} = f^{-1} \circ g^{-1}$.

N.B: The assignment to be done in groups of 10. Groups less than 10 people will be penalized.
The deadline should be adhered to.