Part IA — Numbers and Sets Example Sheet 4.5

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Examples worked through by Christopher Turnbull

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QUESTION 1

QUESTION 2

QUESTION 3

QUESTION 4

QUESTION 5

Let $f : X \to Y$ be a function. For $A \subseteq X$ let $f(A) = \{f(x) \ : \ x \in A\}$. For $B \subseteq Y$ let $f^{-1}(B) = \{x \in X \ : \ f(x) \in B\}$. Give proofs or counterexamples of the following claims:

(a) $f(A_1 \cup A_2) = f(A_1) \cup f(A_2)$

(b) $f^{-1}(B_1 \cup B_2) = f^{-1}(B_1) \cup f^{-1}(B_2)$

(c) $f(A_1 \cap A_2) = f(A_1) \cap f(A_2)$

(d) $f^{-1}(B_1 \cap B_2) = f^{-1}(B_1) \cap f^{-1}(B_2)$

(e) $f^{-1}(f(A)) = A$

(f) $f(f^{-1}(B)) = B$

QUESTION 6

QUESTION 7

QUESTION 8

QUESTION 9

QUESTION 10