

Midterm, Part 1

C Term, 2002

- (1) (24 points) If $f : \mathbb{R} \rightarrow \mathbb{R}$ is given by $f : x \mapsto |x - 4|$, and $A = \{t \in \mathbb{R} \mid 3 \leq t \leq 6\}$, $B = \{t \in \mathbb{R} \mid t < 5\}$ and $C = \{-1, 0, 1\}$. Please find each of the following:

(a) $f(A)$

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

(c) $f(f^{-1}(C))$

- (2) (15 points) Please solve the following for x :

$$\frac{-3}{x-4} > x$$

- (3) (15 points) What is the greatest lower bound (glb) and least upper bound (lub) of the following set? Please carefully explain your answer and give it exactly (no approximations).

$$\{\pi, \pi - \frac{1}{2}, \pi - \frac{2}{3}, \pi - \frac{3}{4}, \dots\}$$

- (4) (6 points) Please write the following statement in *if-then* form: “**C** is a necessary condition for **B**.”

- (5) (20 points) Please prove the following: If $f : X \rightarrow Y$, f is one-to-one, and $A, B \subset X$, then $f(A) \cap f(B) \subset f(A \cap B)$.