Math 173A Homework #1 Extra Problems

1. Prove that $f(x) = \frac{1}{x}, x > 0$ is a convex function by the definition of convex functions.

2. Prove that $f(x) = \sin x$ is not a convex function by the definition of convex functions.

3. Let $f(x)$ be a convex set. If $S = \{x | f(x) \leq 0\}$ is not empty, prove that $S$ is a convex set.

4. Show that $S = \{(x_1, x_2) | x_1 + x_2 \leq 1, x_1 \geq 0, x_2 \geq 0\}$ is a convex set.