MAT 67 Homework 1

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1. Let a, b, c and d be fixed real numbers and consider the following system of linear equations in two real variables x_1 and x_2

$$ax_1 + bx_2 = 0$$
$$cx_1 + dx_2 = 0$$

Note that $x_1 = x_2 = 0$ is a solution of the above equations for any choice of a, b, c, and d.

Prove that if $ad - bc \neq 0$, then $x_1 = x_2 = 0$ is the only solution.

2. Let $z, w \in \mathbb{C}$.

Prove:

$$|z - w|^2 + |z + w|^2 = 2(|z|^2 + |w|^2)$$