Problem 9 For the following $T : \mathbb{R}^2 \to \mathbb{R}^2$ state why T is not linear

(a) $T(a_1, a_2) = (1, a_2)$

Proof: $T(0,0) = (1,0) \neq (0,0)$

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(b) $T(a_1, a_2) = (a_1, a_2{}^2)$

Proof: $T(2(1,1)) = T(2,2) = (2,4) \neq 2T(1,1) = 2(1,1) = (2,2)$

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(c) $T(a_1, a_2) = (\sin a_1, 0)$

Proof: $T(\frac{1}{2}(\pi, 0)) = (\sin \frac{\pi}{2}, 0) = (1,0) \neq \frac{1}{2}T(\pi, 0) = \frac{1}{2}(sin\pi, 0) = (0,0)$

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(d) $T(a_1, a_2) = (|a_1|, a_2)$

Proof: $T(-1(1,1)) = (|-1|, -1) = (1, -1) \neq -1T(1,1) = (-1,-1)$

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(e) $T(a_1, a_2) = (a_1 + 1, a_2)$

Proof: $T(0,0) = (1,0) \neq (0,0)$

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