Your Name:

Duration of the Quiz is 25 minutes. There are three problems, worth 20 points. Show all your work for full credit. Books, notes etc. are prohibited.

(1) (2 points each) True/False. If false, explain why.

- $\{f \mid f$ is a polynomial with real coefficients such that $f(5) = 0\,\}$ is a real vector space.

- $\{f \mid f$ is a polynomial with real coefficients such that $f(5) = 1\,\}$ is a real vector space.

- The set of all convergent sequences is a real vector space.

- The set of all non-decreasing sequences is a real vector space.

- $\{f : \mathbb{R} \to \mathbb{R} \mid f(5) \geq 0\}$ is a real vector space.

- $\{f : \mathbb{R} \to \mathbb{R} \mid f(5) = f(8)\}$ is a real vector space.

(2) (4 points) Prove that the set $\{(x_1, x_2, x_3) \in \mathbb{R}^3 : x_1 + 2x_2 + 3x_3 = 0\}$ is a subspace of $\mathbb{R}^3$.

(3) (1 point each) True/False. If false, explain why.

- $\{(x_1, x_2, x_3) \in \mathbb{R}^3 : x_1^3 = x_2^3\}$ is a subspace of $\mathbb{R}^3$.

- $\{(x_1, x_2, x_3) \in \mathbb{R}^3 : x_1 + 2x_2 + 3x_3 = 4\}$ is a subspace of $\mathbb{R}^3$.

- $\{(x_1, x_2, x_3) \in \mathbb{R}^3 : x_1 x_2 x_3 = 0\}$ is a subspace of $\mathbb{R}^3$.

- $\{(x_1, x_2, x_3) \in \mathbb{R}^3 : x_1 = 5x_3\}$ is a subspace of $\mathbb{R}^3$.