

This quiz is worth 10 points.

1. (8 points) Determine whether each of the following scalar-valued functions of n -vectors is linear. If it is a linear function, give its inner product representation (i.e. an n vector a for which $f(x) = a^T x$ for all x). If it is not linear, give specific x, y, α , and β for which superposition fails:

$$(i.e. f(\alpha x + \beta y) \neq \alpha f(x) + \beta f(y)).$$

- (a) $f(x)$ is the average of the first 3 entries of vector x . You can assume $n \geq 3$.

- (b) $f(x)$ is minimum entry of x . That is $f(x) = \min\{x_1, x_2, x_3, \dots, x_n\}$.

2. (2 points) Suppose $f : \mathbb{R}^3 \rightarrow \mathbb{R}$ is a **linear function**. Further, suppose, $f(2, -4, 3) = 10$ and $f(2, 1, 0) = 8$. Determine the value of $f(2, -9, 6)$ if possible. If this is not possible, explain why.