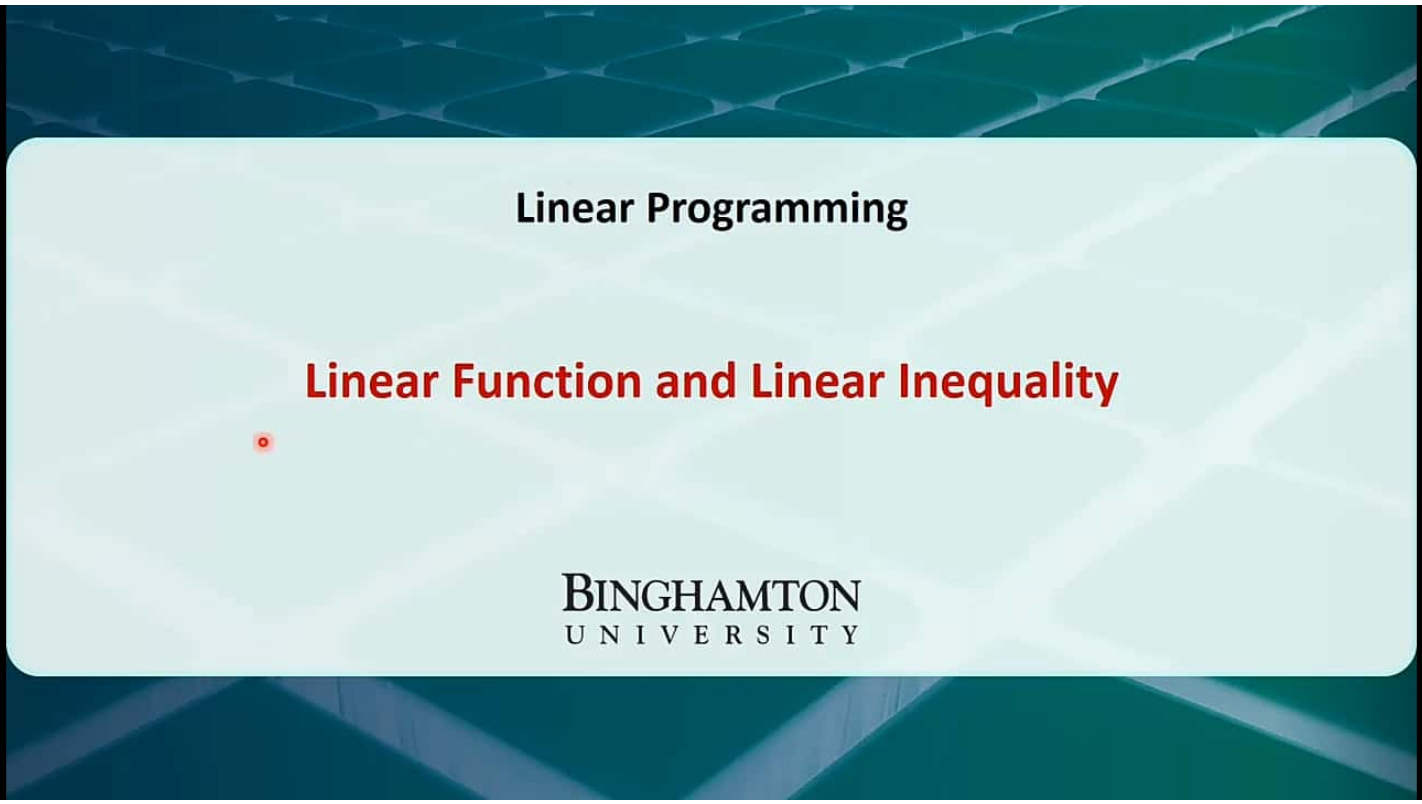

Linear Function & Inequality

- A function $f(x_1, x_2, \dots, x_n)$ is a linear function iff it can be written in the following form $f(x_1, x_2, \dots, x_n) = c_1x_1 + c_2x_2 + \cdots + c_nx_n$ where $c_1, c_2, \dots, c_n$ are constants

- For any linear function $f(x_1, x_2, \dots, x_n)$ and any constant number b, the inequalities $f(x_1, x_2, \dots, x_n) \geq b$ and $f(x_1, x_2, \dots, x_n) \leq b$ are linear inequalities

Examples

- Decision variables x_1, x_2, and x_3

$$-2x_1 + 5x_2 - x_3 \leq 4$$
$$2x_1x_2 + 2x_3 + 3x_3^2 \leq 3$$
$$e^a x_1 + \ln(b)\, x_2 \geq x_3 + c, \quad a, b, c \text{ are constants}$$
$$(x_1 + 2x_2 + 3x_3)(x_1 + x_2 - x_3) \geq 4$$

- A function that is not linear is called nonlinear