

# Linear algebra Exercises

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## 1 Week 46

### 1.1 Which equation are linear in $x_1$ , $x_2$ and $x_3$

**1.1.1**  $x_1 + 5x_2 - \sqrt{2}x^3 = 1$

This is a linear equation

**1.1.2**  $x_1 = -7x_2 + 3x_3$

This is a linear equation

**1.1.3**  $x_1^{3/5} - 2x_2 + x_3 = 4$

This is not a linear equation with  $x_1$  having a power

### 1.2 Convert from matrix form to equation form

$$\begin{bmatrix} 2 & 0 & 0 \\ 3 & -4 & 0 \\ 0 & 1 & 1 \end{bmatrix}$$

$$2x_1 = 0$$

$$3x_1 - 4x_2 = 0$$

$$x_2 = 1$$

### 1.3 Convert from equations to matrix

$$-6x_1 - x_2 + 3x_3 = 4$$

$$5x_2 - x_3 = 1$$

$$\begin{bmatrix} -6 & -1 & 3 & 4 \\ 0 & 5 & -1 & 1 \end{bmatrix}$$

### 1.4 Determine if the solution hold in the following system

$$(5, 8, 1)$$

$$x + 2y - 2z = 3$$

$$3x - y + z = 1$$

$$-x + 5y - 5z = 5$$

$$5 + 2(8) - 2(1) = 3$$

$$19 = 3$$

By the first equation the solution does not hold

**1.5 Determine if the following matrices are in echelon form or reduced echelon form**

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Reduced echelon form

$$\begin{bmatrix} 1 & -3 & 4 & 7 \\ 0 & 1 & 2 & 2 \\ 0 & 0 & 1 & 5 \end{bmatrix}$$

Echelon form