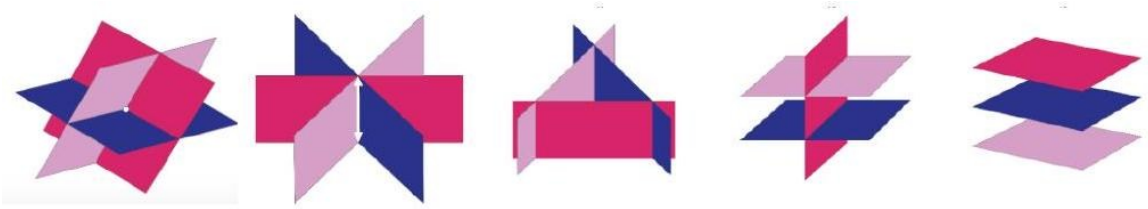
# Math 1050 ~ College Algebra

# 22 Systems of Linear Equations and Applications

A **linear equation in three variables**, $x, y$ and $z$ is an equation of the form $ax + by + cz = d$ where $a, b, c$ and $d$ are constants and at least one of $a, b$ and $c$ is nonzero. Such an equation represents a plane in 3-D space.

Here are some possibilities of the intersection of three planes.



We will solve these equations by using linear combinations. Your goal is to solve for $x, y$ and $z$. This procedure is called **Elimination**.

Here are the legitimate actions you may take.

1. Exchange two rows.
2. Multiply a row by a constant.
3. Temporarily multiply a row by a constant and add it to another row, replacing either of those rows with the result.

## EX 1

Solve this system by using Elimination.

$$\begin{aligned} x - y + z &= 4 \\ x + 3y - 2z &= -3 \\ 3x + 2y + 2z &= 6 \end{aligned}$$

## EX 2

Solve

$$\begin{aligned} x - 2y + z &= 4 \\ 3x - 6y + 3z &= 7 \\ 2x + y + 4z &= 2 \end{aligned}$$

## EX 3

Solve

$$\begin{aligned} x - 2y - z &= -5 \\ 2x + y + z &= 5 \end{aligned}$$

## EX 4

Find the equation of the parabola, $y = ax^2 + bx + c$ that passes through these three points, $(0,3), (1,4)$ and $(2,3)$.