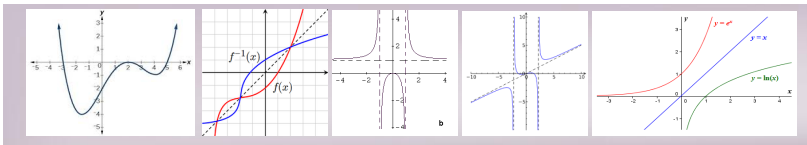

Math 1050 ~ College Algebra

$$\begin{bmatrix} -3 & 4 \\ 2 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ -10 \end{bmatrix}$$

22 Systems of Linear Equations and Applications

Learning Objectives

- Solve systems of three linear equations in three variables.
- Interpret solutions to 3×3 systems of linear equations.
- Solve applications of linear equations in three variables.

$$\sum_{k=1}^{m} k = \frac{m(m+1)}{2}$$

$$\sum_{k=0}^{n} z^k = \frac{1-z^{n+1}}{1-z}$$

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).