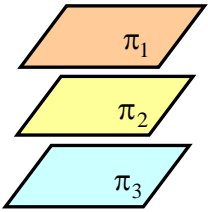
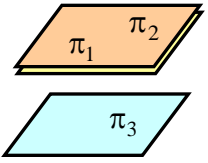
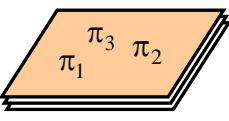
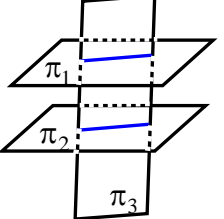
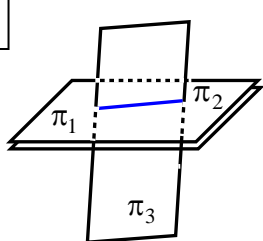
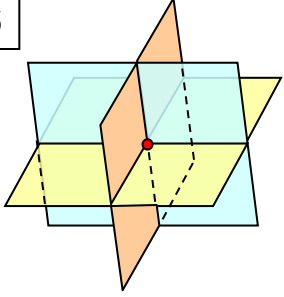
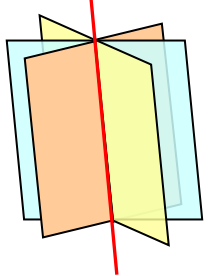
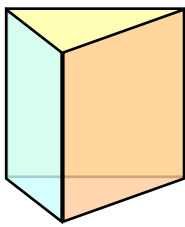


Date:

THE INTERSECTION OF THREE PLANES (8 CASES)

$\pi_1 // \pi_2 // \pi_3$ (All are distinct) (No Intersection)	$\pi_1 // \pi_2$ (Coincident) and $// \pi_3$ (Distinct) No Intersection	$\pi_1 // \pi_2 // \pi_3$ (All are Coincident) (Infinite Intersections)	$\pi_1 // \pi_2$ (Distinct) $\nparallel \pi_3$ (No Intersection)
1 	2 	3 	4 
$\pi_1 // \pi_2$ (Coincident) $\nparallel \pi_3$ (Line of Intersection)	$\pi_1 \nparallel \pi_2 \nparallel \pi_3$ (Point of Intersection) $\vec{n} \cdot (\vec{n}_2 \times \vec{n}_3) \neq 0$	$\pi_1 \nparallel \pi_2 \nparallel \pi_3$ (Line of Intersection) $\vec{n} \cdot (\vec{n}_2 \times \vec{n}_3) = 0$	$\pi_1 \nparallel \pi_2 \nparallel \pi_3$ (No Intersection) $\vec{n} \cdot (\vec{n}_2 \times \vec{n}_3) = 0$
5 	6 	7 	8 

Example 1 (Intersection of 3 planes when they are not parallel)

Find the intersection of π_1 , π_2 , and π_3 , if any

- a) $\pi_1: x + 2y + 2z = 6$
 $\pi_2: 3x + 2y + z = 9$
 $\pi_3: 2x + 5y + 5z = 14$

Intersection of Three Planes

Date:

$$\begin{aligned} \text{b) } \pi_1: x + y + 2z &= -2 \\ \pi_2: 3x - y + 14z &= 6 \\ \pi_3: x + 2y &= -5 \end{aligned}$$

Example 6
System of Equations
Gauss-Jordan Elimination

Recall :

$$\left[\begin{array}{ccc|c} 1 & 0 & 4 & 1 \\ 0 & 1 & -2 & -3 \\ 0 & 0 & 0 & 0 \end{array} \right] \rightarrow$$

$$\begin{aligned} \text{c) } \pi_1: x - y + 4z &= 5 \\ \pi_2: 3x + y + z &= -2 \\ \pi_3: 5x - y + 9z &= 1 \end{aligned}$$

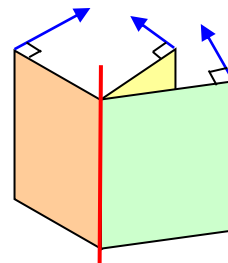
Example 7
System of Equations
Gauss-Jordan Elimination

Recall :

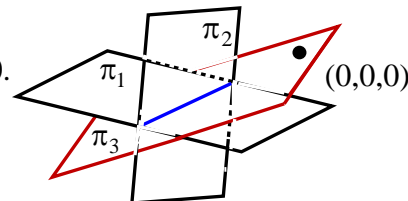
$$\left[\begin{array}{ccc|c} 1 & -1 & 4 & 5 \\ 0 & 4 & -11 & -17 \\ 0 & 0 & 0 & -7 \end{array} \right] \rightarrow$$

Example 2: Intersection of 3 planes with conditionsFor what value of k will the following set of planes intersect in a line?

$$\begin{aligned} x - 2y - z &= 0 \\ x + 9y - 5z &= 0 \\ kx - y + z &= 0 \end{aligned}$$



$$\vec{n} \cdot (\vec{n}_2 \times \vec{n}_3) = 0$$

Example 3: Intersection of planes with conditionsFind the scalar equation of the plane that passes through the origin and the line of intersection of the planes $\pi_1: 3x + 4y - 7z - 2 = 0$ and $\pi_2: 2x + 3y - 4 = 0$.**Scalar Eqn of plane thru point & Line of Intersection of 2 planes**

- 1) Let $\pi_1 + k\pi_2 = 0$
- 2) Substitute the point into (1) and solve for k .
- 3) Write & simplify the equation in (1) with k .