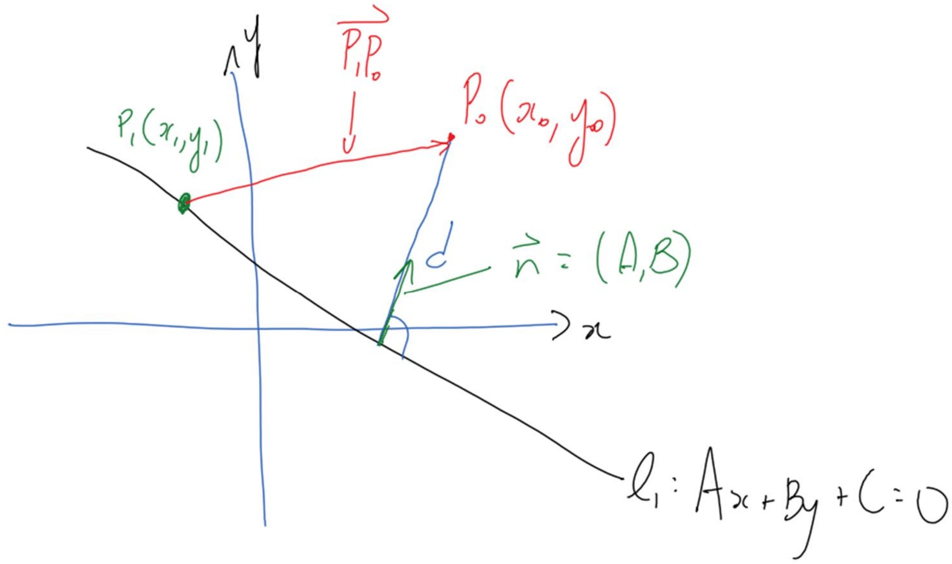
9.5 9.6 Distances and Vectors

9.5 Distance Between a Point and a Line

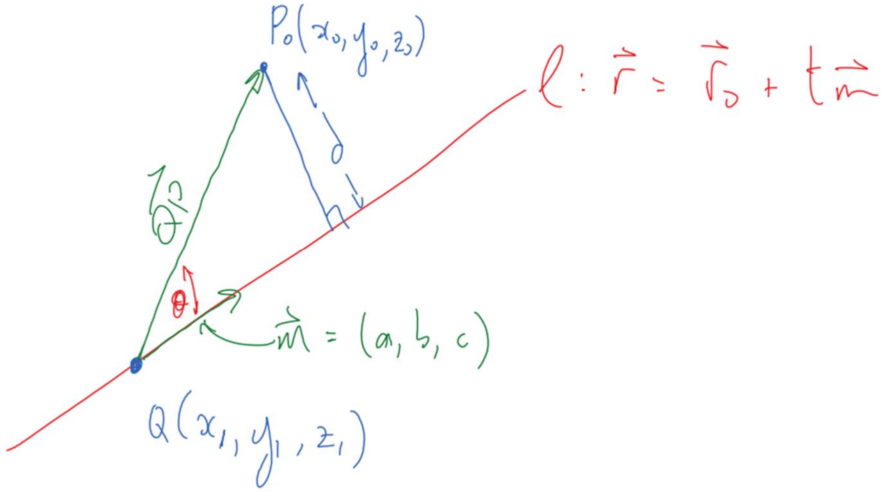
A) We'll begin this exploration in $\mathbb{R}^2$. Consider the picture:



Note that the distance *d* lies along the direction of the normal $\vec{n}$. Think **projection**!

B) Distance between a point and a line in $\mathbb{R}^3$. (Note that in $\mathbb{R}^3$ lines have no normals!)

Consider the picture:

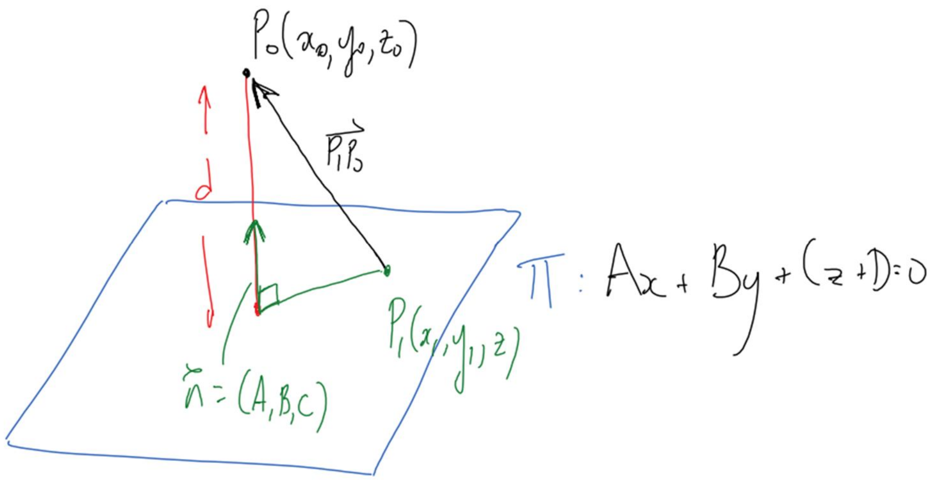


Note that

$$\sin(\theta) = \frac{d}{\left|\overrightarrow{QP}\right|}$$

9.6 Distance Between a Point and a Plane

Consider the picture:



Example 9.5.1

Determine the distance between the parallel lines $\left(\text{in } \mathbb{R}^2\right)$

1) $\vec{r} = (3,-2) + s(2,1),\ s \in \mathbb{R}$

2) $\vec{r} - (4,1) + t(2,1),\ t \in \mathbb{R}$

Example 9.5.2

Determine the distance from $P_0(3,1,-2)$ to the line $\vec{r} = (2,1,0) + t(1,-2,-1),\ t \in \mathbb{R}$.

Example 9.5.3

Determine the distance between the (parallel) planes:

$$\pi_1 : 3x - y + 4z + 7 = 0$$

$$\pi_2 : 3x - y + 4x - 3 = 0$$

Class/Homework for Section 9.5 9.6

Pg. 540 – 541 #5 – 8 (read Ex. 4 Method 2 for #8)
Pg. 550 #2, 3, 5 (read Ex. 2 pg. 544 for #2)