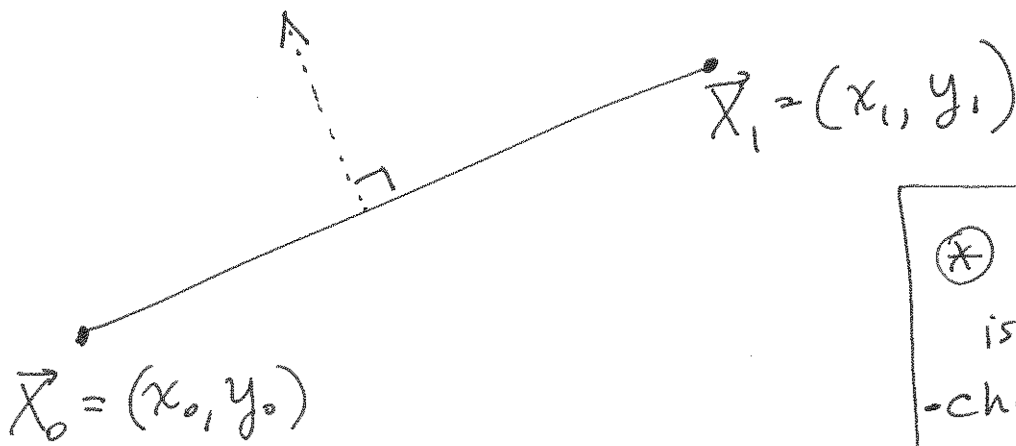
Implicit Line Equation (~slide 14)



(*) choice of $\vec{N}$ is <u>not</u> unique.
- choice of up/down
- choice of length

$$f(\vec{x}) = f(x,y) = \vec{N} \cdot (\vec{X} - \vec{X}_0) = 0$$

knowns: $\vec{X}$, $\vec{X}_0$

<u>what is $\vec{N}$?</u> $\vec{N}$ is <u>orthogonal</u> to the vector $\vec{X}_1 - \vec{X}_0$

$$\vec{X}_1 - \vec{X}_0 = (x_1 - x_0,\ y_1 - y_0)$$

$$\vec{N} = (y_0 - y_1,\ x_1 - x_0)$$

[choose x-component negative, y-component positive, to get $\vec{N}$ as pictured] (*)

With this choice:

$$f(x,y) = (y_0 - y_1,\ x_1 - x_0) \cdot (x - x_0,\ y - y_0)$$

$$= (y_0 - y_1)(x - x_0) + (x_1 - x_0)(y - y_0) = 0$$

$$= (y_0 - y_1)x + (x_1 - x_0)y \underbrace{- (y_0 - y_1)x_0 - (x_1 - x_0)y_0}_{} = 0$$

$$= A x + B y + C = 0$$

simplify OVER

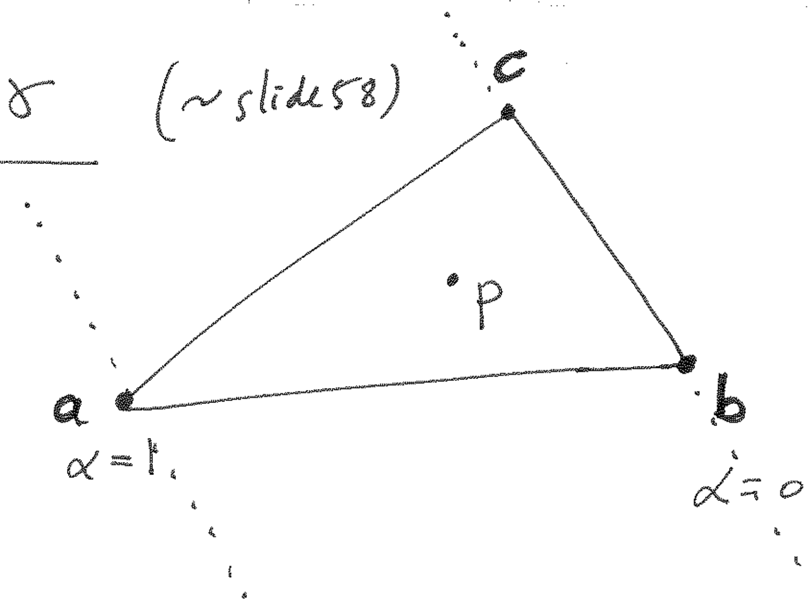
$C =$

$-(y_0 - y_1)x_0 - (x_1 - x_0)y_0$

$= \underline{-x_0 y_0} + x_0 y_1 + \underline{x_0 y_0} - x_1 y_0$

$= x_0 y_1 - x_1 y_0$

Find α, β, γ ($\sim$ slide 58)



Example: find α

$$f_{bc}(x,y) = (y_b - y_c)x + (x_c - x_b)y + x_b y_c - x_c y_b$$

$f_{bc}(x_p, y_p)$ gives a "distance" from the line $\vec{b}\vec{c}$. We want to normalize this distance so that the distance at $\vec{a}$ is $= 1$.

$$\alpha(x,y) = \frac{f_{bc}(x,y)}{f_{bc}(x_a, y_a)}$$

Analogously, find β or γ.