CSE 107 - HW5

10.22 a) Develop a general procedure for obtaining the normal representation of a line from its slope-intercept form $y=ax+b$

- Normal form of equation: $x\cos(\alpha)+y\sin(\alpha)=\rho$

This is where "ρ" is the perpendicular distance from line to origin and from general equation of the line: $Ax+Cy=B$

- $A=-a$
- $C=1$
- $B=b$

- $\sqrt{A^2+C^2}=\sqrt{(-a)^2+(1)^2}$

$$-ax+1y=b$$
$$\downarrow$$
$$\frac{-a}{\sqrt{(-a)^2+(1)^2}}x+\frac{1}{\sqrt{(-a)^2+1^2}}y=\frac{b}{\sqrt{(-a)^2+1^2}}$$
$$\Downarrow$$
$$\frac{-a}{\sqrt{a^2+1}}x+\frac{1}{\sqrt{a^2+1}}y=\frac{b}{\sqrt{a^2+1}}$$

- $\cos(x)=\frac{-a}{\sqrt{a^2+1}}$

$$\Downarrow$$

$$\alpha=\cos^{-1}\left(\frac{-a}{\sqrt{a^2+1}}\right)$$

- $\sin(x)=\frac{1}{\sqrt{a^2+1}}$

$$\rho=\frac{b}{\sqrt{a^2+1}}$$

$$\Downarrow$$

$$\alpha=\sin^{-1}\left(\frac{1}{\sqrt{a^2+1}}\right)$$

* the normal form of the equation:

$$\boxed{x\cdot\cos\left(\cos^{-1}\left(\frac{-a}{\sqrt{a^2+1}}\right)\right)+y\sin\left(\cos^{-1}\left(\frac{-a}{\sqrt{a^2+1}}\right)\right)=\frac{b}{\sqrt{a^2+1}}}$$