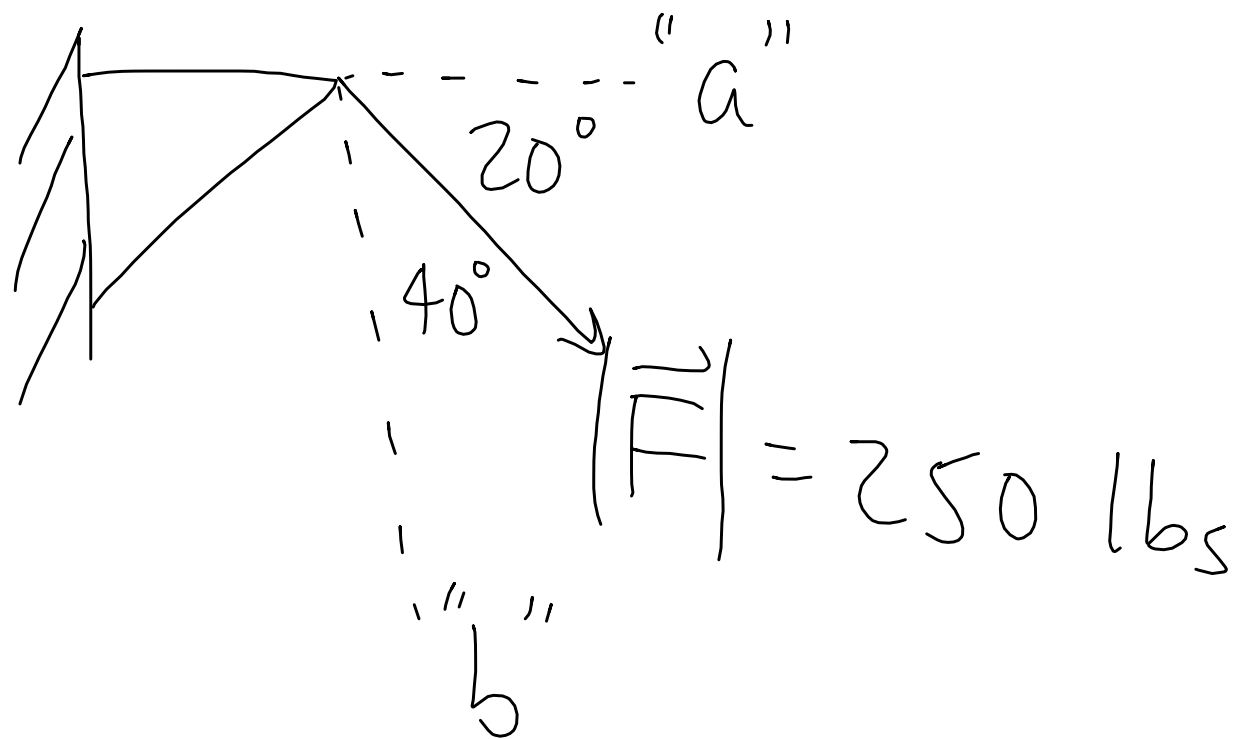


$$\vec{F} = 3\hat{i} + 4\hat{j} + 5\hat{k}$$

$$\hat{u}_F = \frac{3\hat{i} + 4\hat{j} + 5\hat{k}}{\sqrt{3^2 + 4^2 + 5^2}}$$

$$A(2, 7, -3) \quad B(-2, 6, 5)$$

$$\vec{r}_{AB} = -4\hat{i} - \hat{j} + 8\hat{k}$$



Re write

$$F \Rightarrow F_a \hat{u}_a + F_b \hat{u}_b$$

Naive \Rightarrow

$$F_a = F \cdot \hat{u}_a = 234.9$$

$$F_b = F \cdot \hat{u}_b = 191.5$$

$$\vec{F} = 250 \cos 20^\circ \hat{i} - 250 \sin 20^\circ \hat{j}$$

$$= F_a \hat{u}_a + F_b \hat{u}_b$$

$$= F_a \hat{i} + F_b (\cos 60^\circ \hat{i} - \sin 60^\circ \hat{j})$$

$$\hat{i}: 250 \cos 20^\circ = F_a + F_b \cos 60^\circ$$

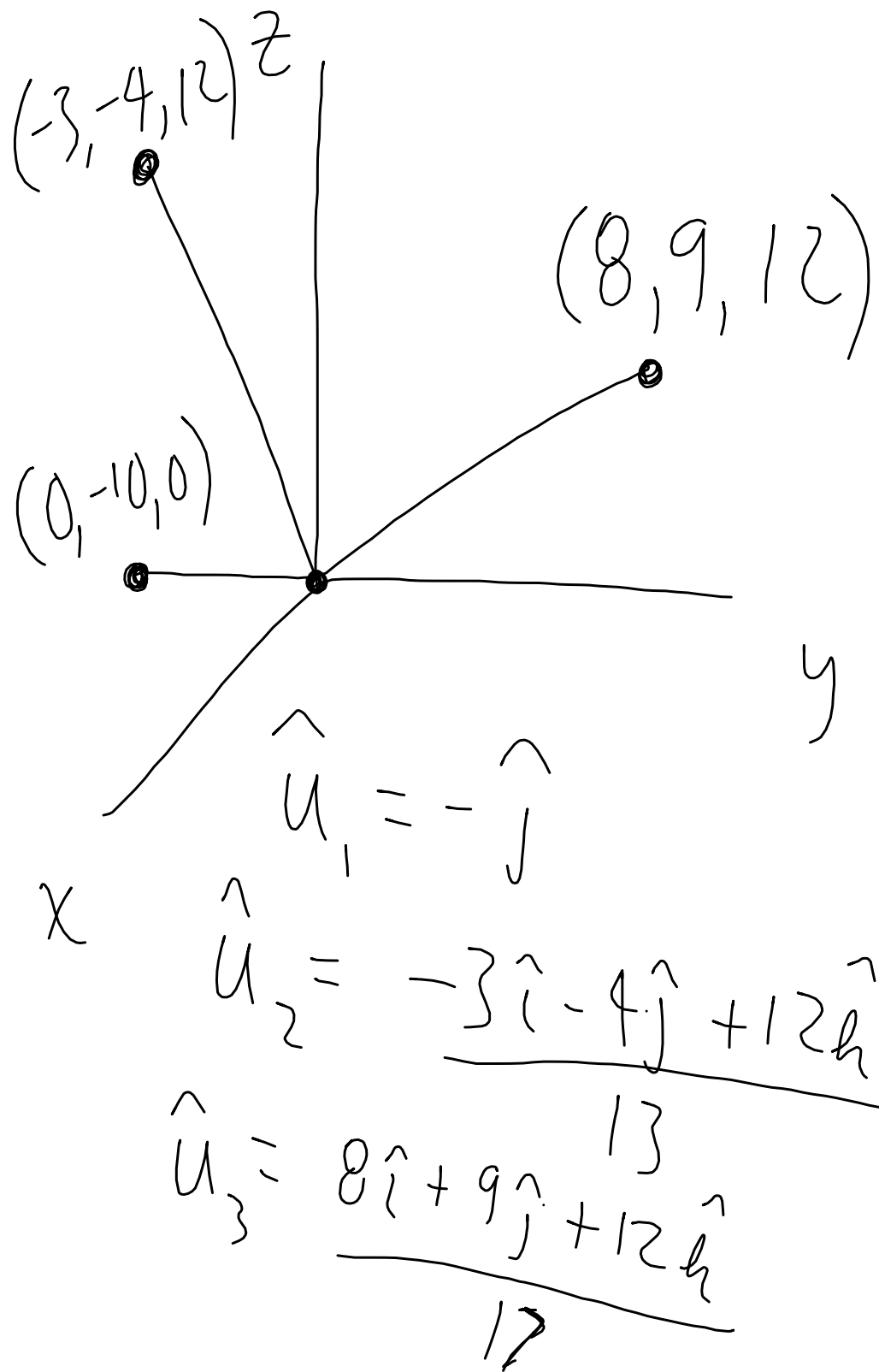
$$\hat{j}: -250 \sin 20^\circ = -F_b \sin 60^\circ$$

$$F_a = 186 \quad F_b = 98.7$$

$$\vec{A} \cdot \vec{B} = AB \cos \theta$$

$$\vec{A} \cdot \hat{i} = A (1) \cos \theta_x$$

$$\frac{A_x}{A} = \cos \theta_x \Rightarrow \text{direction cosine}$$

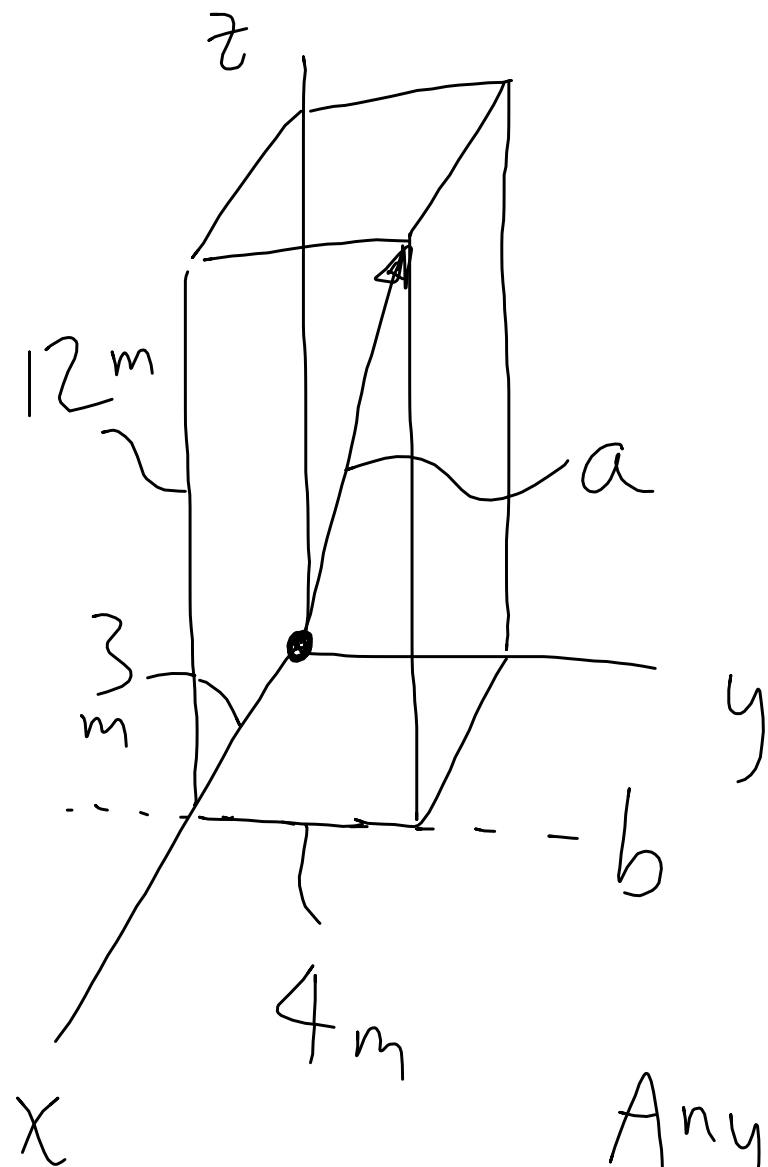


Each cable has tension of 100 lbs
 Replace w/ force in \hat{k} + force in x-y plane
 $100\hat{u}_1 + 100\hat{u}_2 + 100\hat{u}_3$
 $= F_z \hat{k} + F_x \hat{i} + F_y \hat{j}$

$$\hat{i}: \frac{-3}{13}(100) + \frac{8}{17}(100) = F_x$$

$$\hat{j}: -(1)(100) - \frac{4}{13}(100) + \frac{9}{17}(100) = F_y$$

$$\hat{k}: \frac{12}{13}(100) + \frac{12}{17}(100) = F_z$$



What is \perp dist between
line a + line b?

Any old pt on line a
has coordinates

$$(x, \frac{4}{3}x, 4x)$$

Any pt on line b has coords

$$(3, y, 0)$$

Vector from "any pt" on a to "any pt"

$$\text{on } b = (3-x)\hat{i} + \left(y - \frac{4}{3}x\right)\hat{j} - 4x\hat{k}$$

Make this vector \perp line b

$$\left[(3-x)\hat{i} + \left(y - \frac{4}{3}x\right)\hat{j} - 4x\hat{k} \right] \cdot \hat{j} = 0$$

$$y - \frac{4}{3}x = 0 \Rightarrow y = \frac{4}{3}x$$

So now vector between "any pts"
becomes

$$(3-x)\hat{i} - 4x\hat{k}$$

$$[(3-x)\hat{i} - 4x\hat{k}] \cdot (3\hat{i} + 4\hat{j} + 12\hat{k}) = 0$$

$$(3-x)3 - 4x(12) = 0$$

$$9 - 3x - 48x = 0$$

$$x = \frac{9}{51} = \frac{3}{17}$$

So \perp dist is

$$\sqrt{\left(3 - \frac{3}{17}\right)^2 + \left[4\left(\frac{3}{17}\right)\right]^2} = 2.91 \text{ m}$$