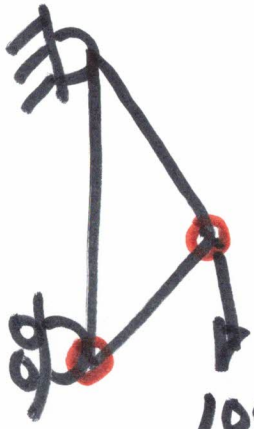
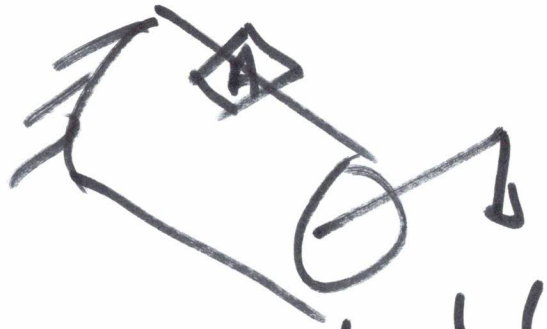




combined loading + failure criterion

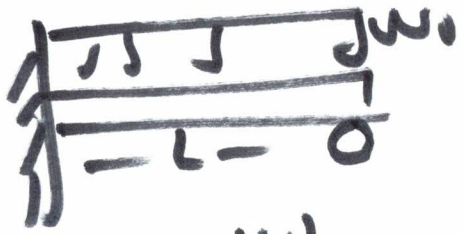
$$\sigma_{vm} = \frac{1}{\sqrt{2}}\left[(\sigma_x-\sigma_y)^2+(\sigma_y-\sigma_z)^2+(\sigma_z-\sigma_x)^2+6\tau_{xy}^2+6\tau_{xz}^2+6\tau_{yz}^2\right]^{1/2}$$

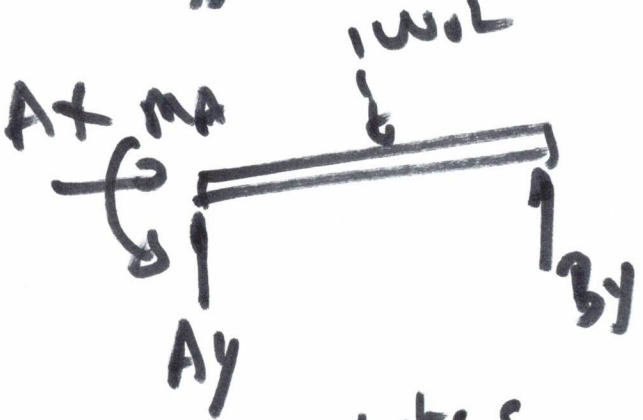
if $\sigma_{vm} > \sigma_{yield}$ then material yields

MAX shear stress theory

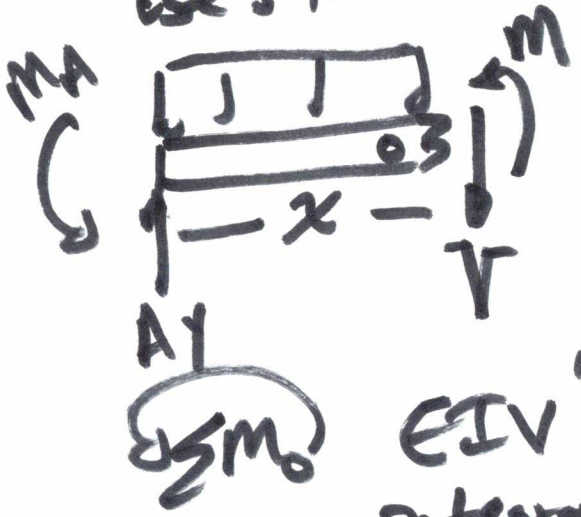
$\tau_{MAX\ ABS} \geq \frac{\sigma_{yield}}{2}$ then it yields

indeterminate





use statics



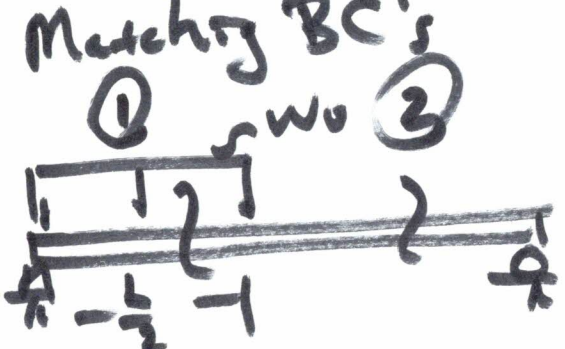
$\sum M_0$

$EIv'' = M$

integrate

apply B.C.'s

Matching BC's



Statics / RXNS

$EIv_1'' = M_1$, $EIv_2'' = M_2$

$\ldots + C_1 x + C_2$ $\ldots + C_3 x + C_4$

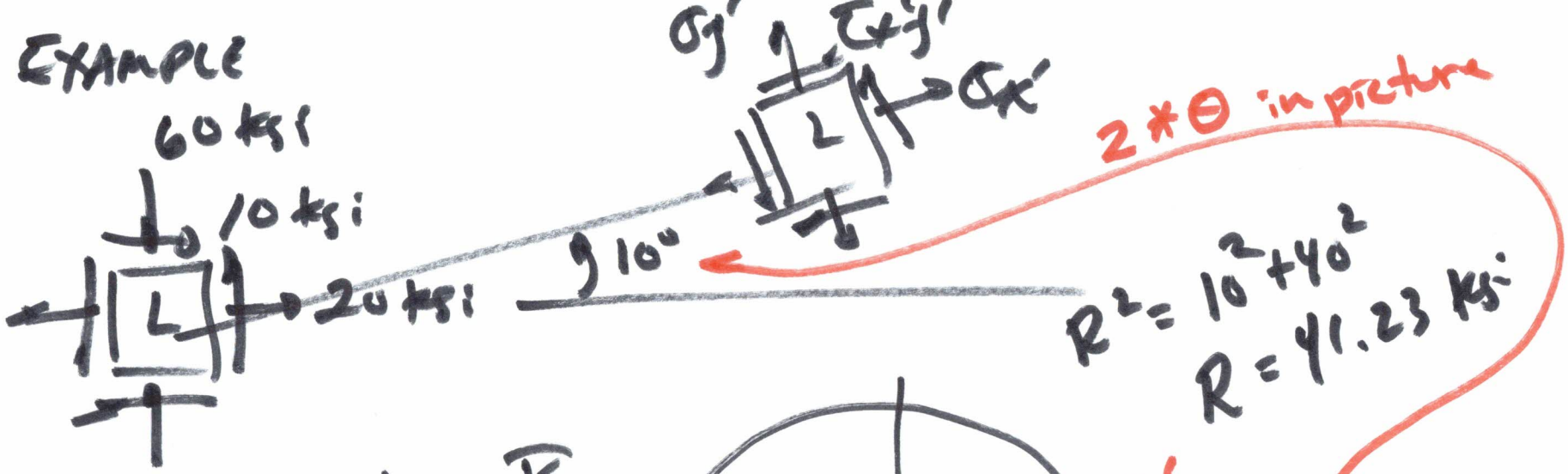
$x=0,\ V_1 = 0$ $x=L\ V_2 = 0$

$V_1' = V_2'$ } @ $x = \frac{L}{2}$

$V_1 = V_2$ }

Apply B.C.'s

EXAMPLE



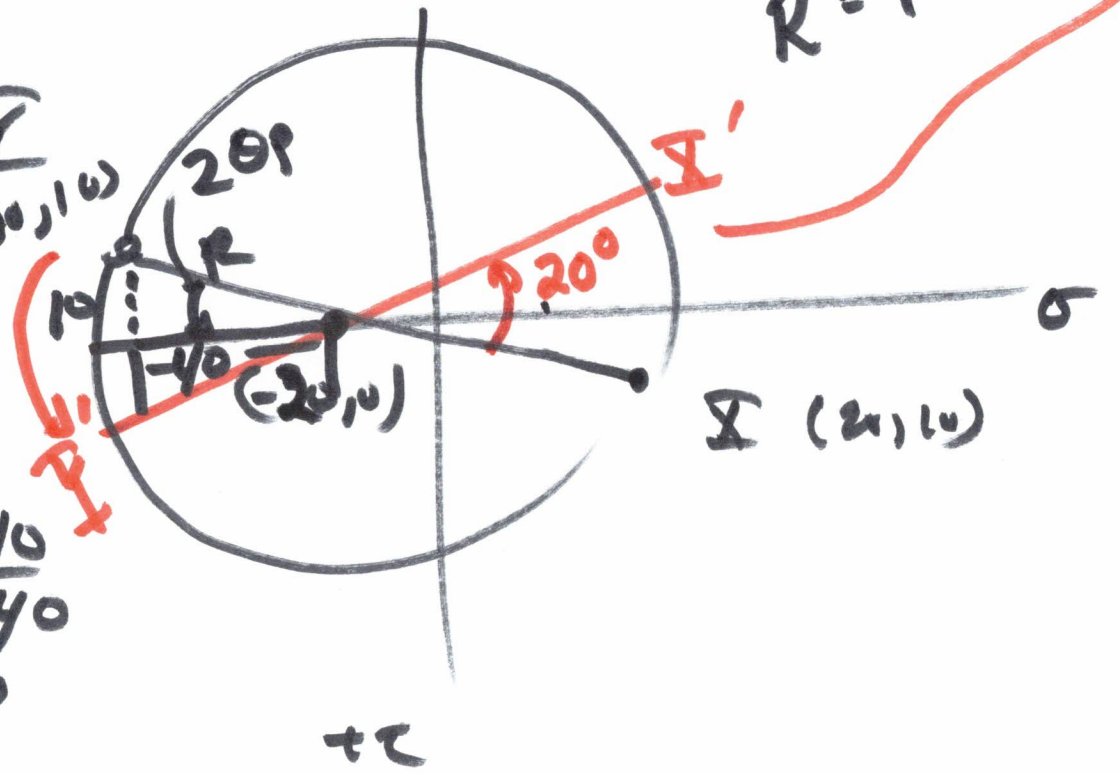
$R^2 = 10^2 + 40^2$

$R = 41.23$ ksi

X : (20, 10)

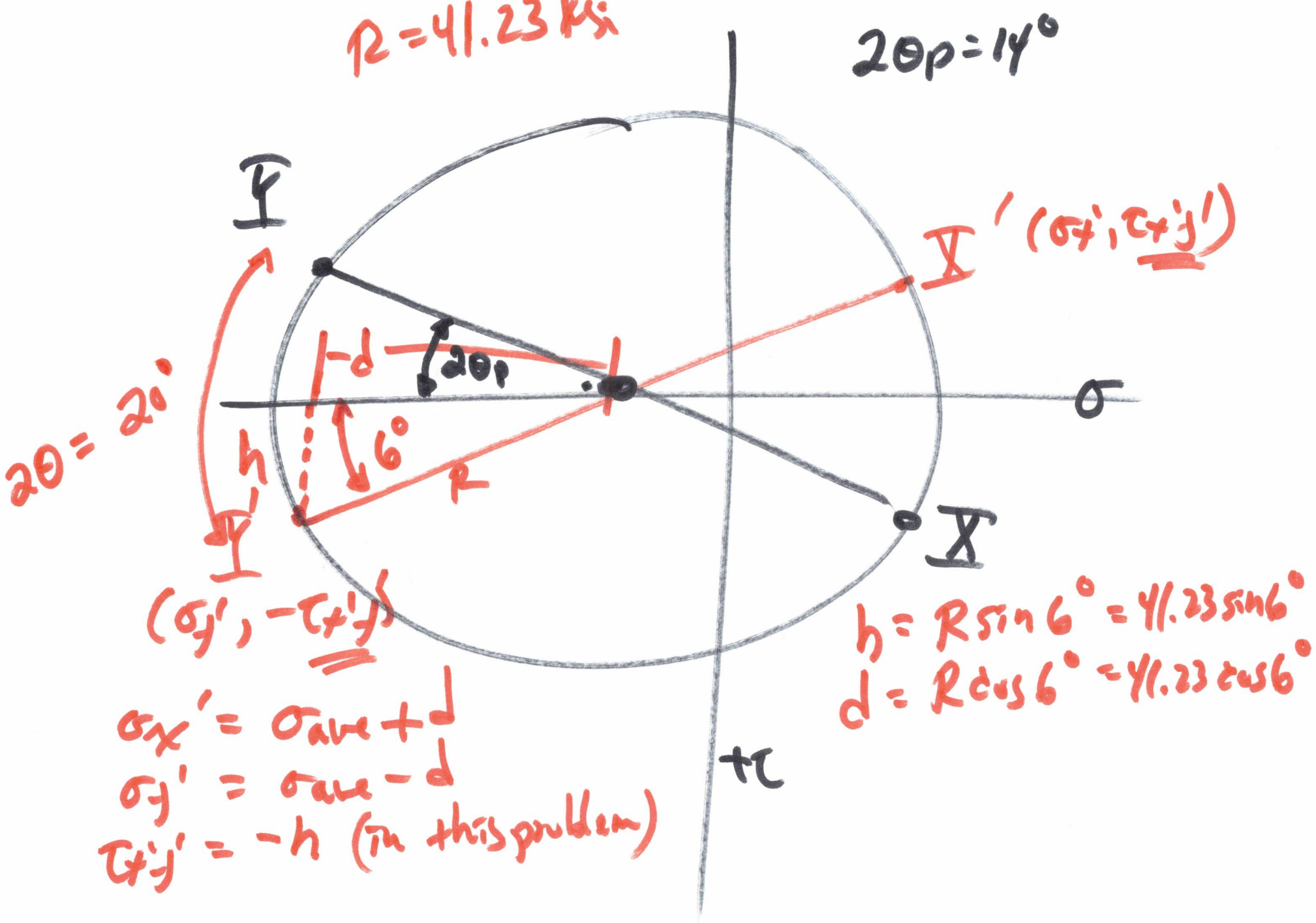
Y : (-60, -10)

C : (-20, 0)



$\tan 2\theta_p = \frac{10}{40}$

$2\theta_p = 14^\circ$



$h = R \sin 6^\circ = 41.23 \sin 6^\circ$

$d = R \cos 6^\circ = 41.23 \cos 6^\circ$

$\sigma_x' = \sigma_{ave} + d$

$\sigma_y' = \sigma_{ave} - d$

$\tau_{x'y'} = -h$ (in this problem)