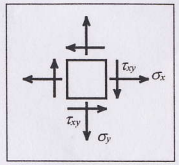
建築構造力学ＩＢ・同演習 第5回　練習問題 実施日2016/11/16	学生証番号		氏名	解答	得点

問1. 下記に示す各応力状態について主応力 σ_1, σ_2 ($\sigma_1 \geqq \sigma_2$)を求めよ。また、モールの応力円を描き、主応力 σ_1, σ_2 の値とその方向を図示しなさい。ただし，単位はkN，m 有効数字3桁で答えなさい。

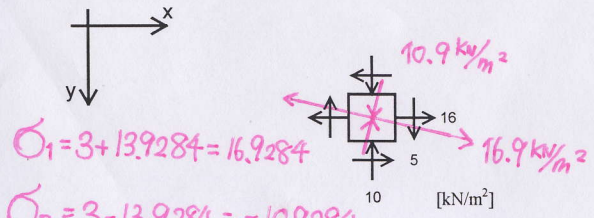


正方向の応力度

(1) σ_1 = 16.9 kN/m², σ_2 = −10.9 kN/m²,

$C = \frac{16-10}{2} = 3$

$R = \sqrt{(\frac{16-(-10)}{2})^2 + 5^2} = 13.9284$

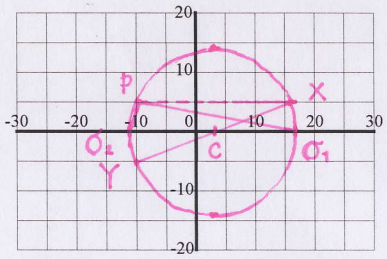


$\sigma_1 = 3 + 13.9284 = 16.9284$

$\sigma_2 = 3 - 13.9284 = -10.9284$

X (16, 5)

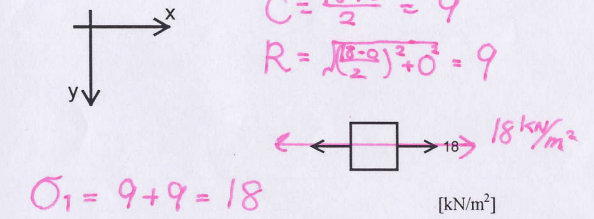
Y (−10, −5)



(2) σ_1 = 18.0 kN/m², σ_2 = 0,

$C = \frac{18+0}{2} = 9$

$R = \sqrt{(\frac{18-0}{2})^2 + 0^2} = 9$

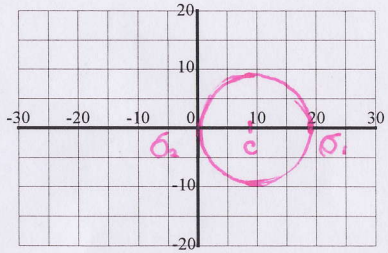


$\sigma_1 = 9 + 9 = 18$

$\sigma_2 = 9 - 9 = 0$

X (18, 0)

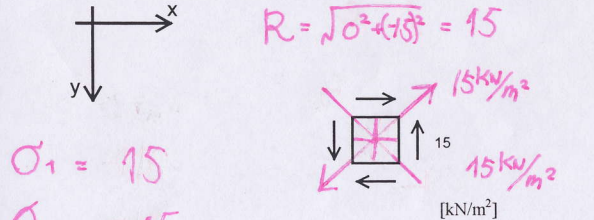
Y (0, 0)



(3) σ_1 = 15.0 kN/m², σ_2 = −15.0 kN/m²,

$C = \frac{0+0}{2} = 0$

$R = \sqrt{0^2 + (-15)^2} = 15$

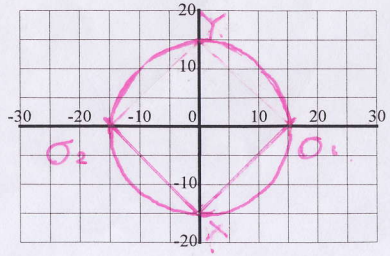


$\sigma_1 = 15$

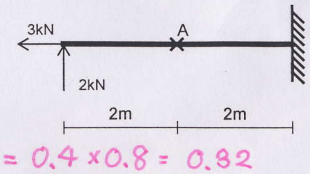
$\sigma_2 = -15$

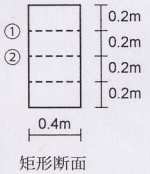
X (0, −15)

Y (0, 15)

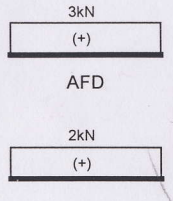


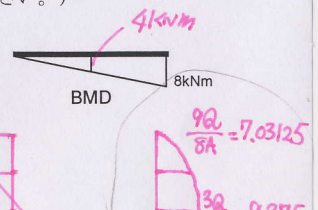
問2. 下図の片持ち梁のA断面に生じている応力度(σ_x , σ_y , τ_{xy})、主応力とその向きを断面図中の①,②の2点について図示せよ。（単位はkN，mを用い、解答は有効数字3桁で答えなさい。）

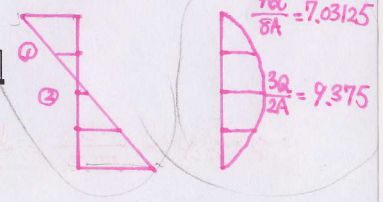




矩形断面







$A = 0.4 \times 0.8 = 0.32$

$Z = \frac{0.4 \times 0.8^2}{6} = 0.042667$

① $\frac{N}{A} - \frac{1}{2} \times \frac{M}{Z} = \frac{3}{0.32} - \frac{1}{2} \times \frac{4}{0.042667} = -37.4996$

$C = \frac{-37.4996}{2} = -18.7498$ $R = \sqrt{(\frac{-37.4996}{2})^2 + (7.03125)^2} = 20.0248$

$\sigma_1 = 1.275$ $\sigma_2 = -38.7746$

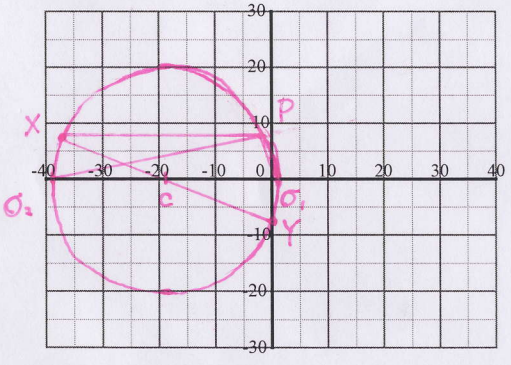
$I_{(y)} = \frac{3Q}{2A}\{1 - (\frac{2y}{h})^2\}$

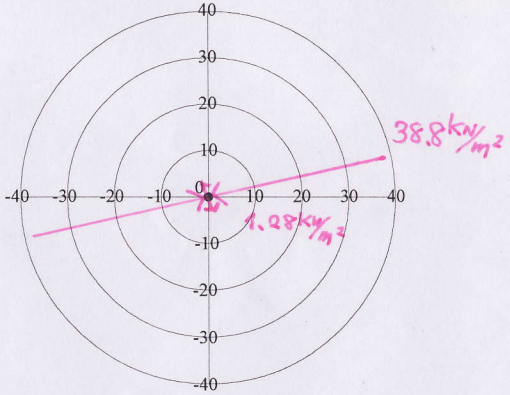
② $\frac{N}{A} = \frac{3}{0.32} = 9.375$

$C = \frac{9.375}{2} = 4.6875$ $R = \sqrt{(\frac{9.375}{2})^2 + (9.375)^2} = 10.4816$

$\sigma_1 = 15.1691$ $\sigma_2 = -5.7941$

① σ_x = −37.5 kN/m², σ_y = 0, τ_{xy} = 7.03 kN/m²





② σ_x = 9.38 kN/m², σ_y = 0, τ_{xy} = 9.38 kN/m²