Key Solution

HOME WORK # 11

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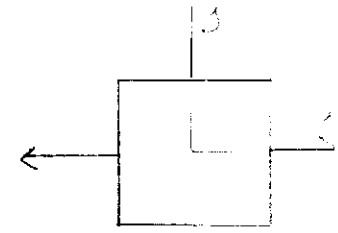
KEY TO HOMEWORK #(11)

PROBLEM #①

SOLUTION:- $x = (4,0)$; $y = (0,0)$



(a) Principal Stress:-

$\sigma_{max} = 4\,ksi$; $\sigma_{min} = 0$

(b) Shear stresses:-

$\tau_{max} = 2\,ksi$; $\tau_{min} = -2\,ksi$

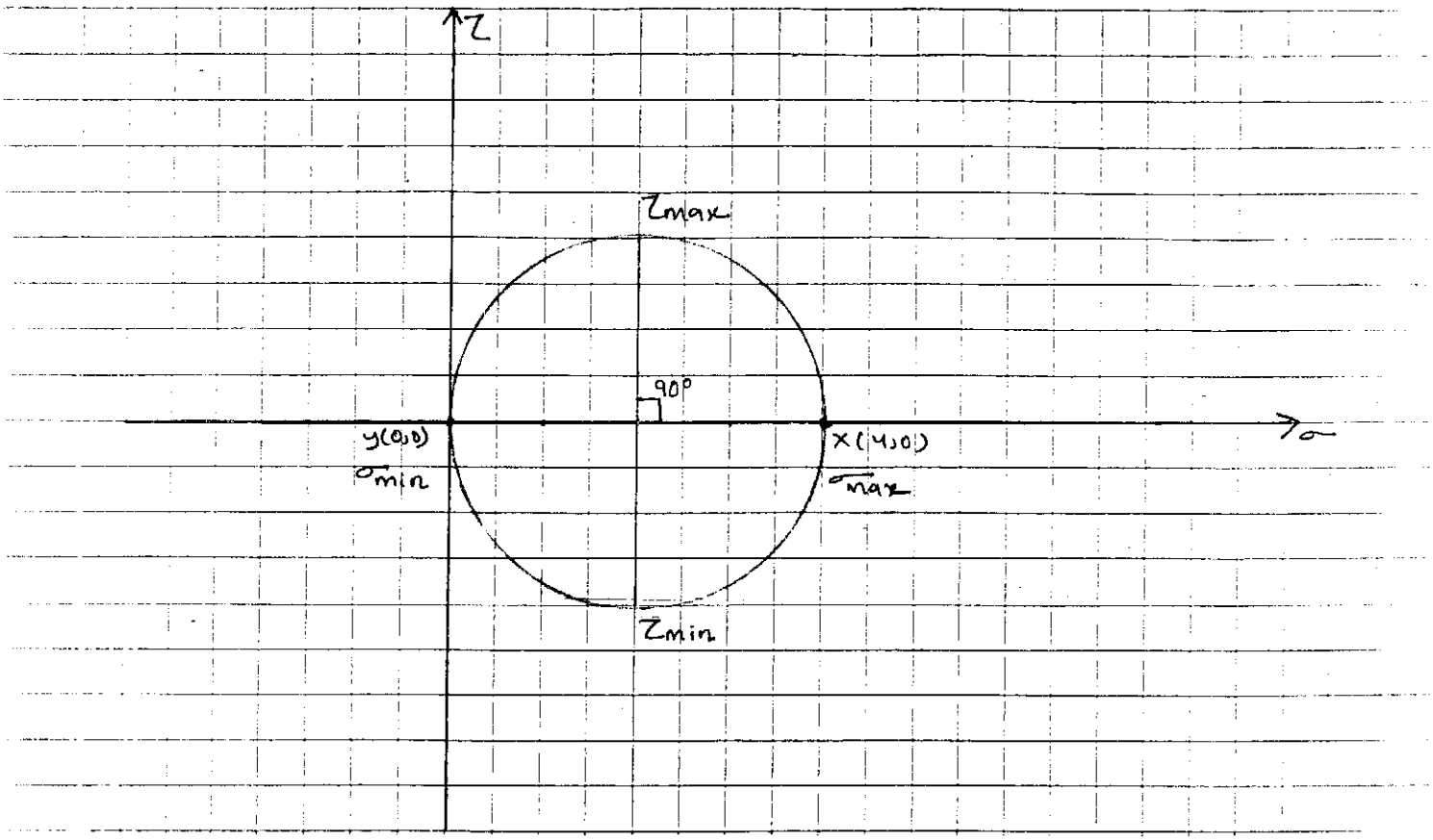
(c) Associated Normal stresses:-

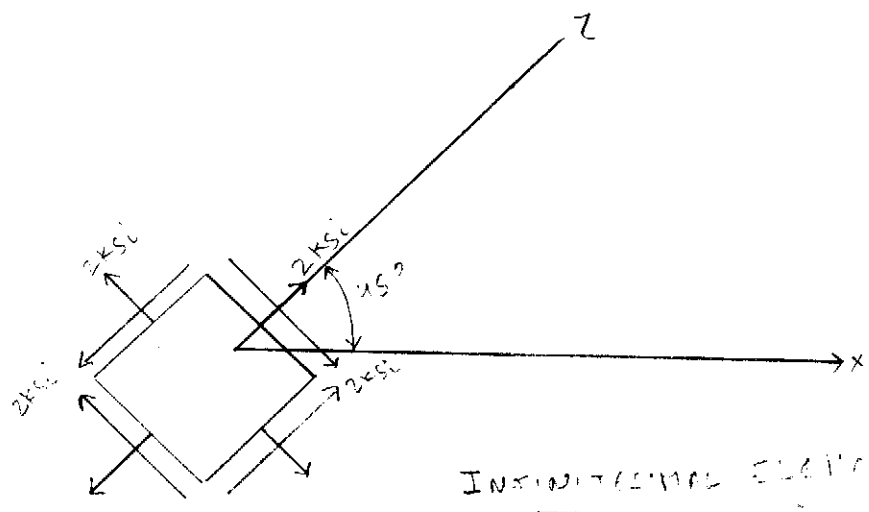
$\sigma = 2\,ksi$

SCALE:-

X-AXIS:- 2 SQUARES = 1 ksi

Y-AXIS:- 2 SQUARES = 1 ksi





INFINITESIMAL ELEMENT

PROBLEM #2!-

SOLUTION!- $X = (0,0)$; $Y = (-8,0)$

(a) Principal Stresses!-

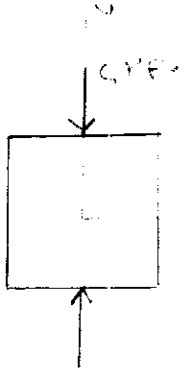
$\sigma_{max} = -8\,MPa$ (compression); $\sigma_{min} = 0$

(b) Shear Stresses!-

$\tau_{max} = 4\,MPa$; $\tau_{min} = -4\,MPa$

(c) Associated Normal Stress!-

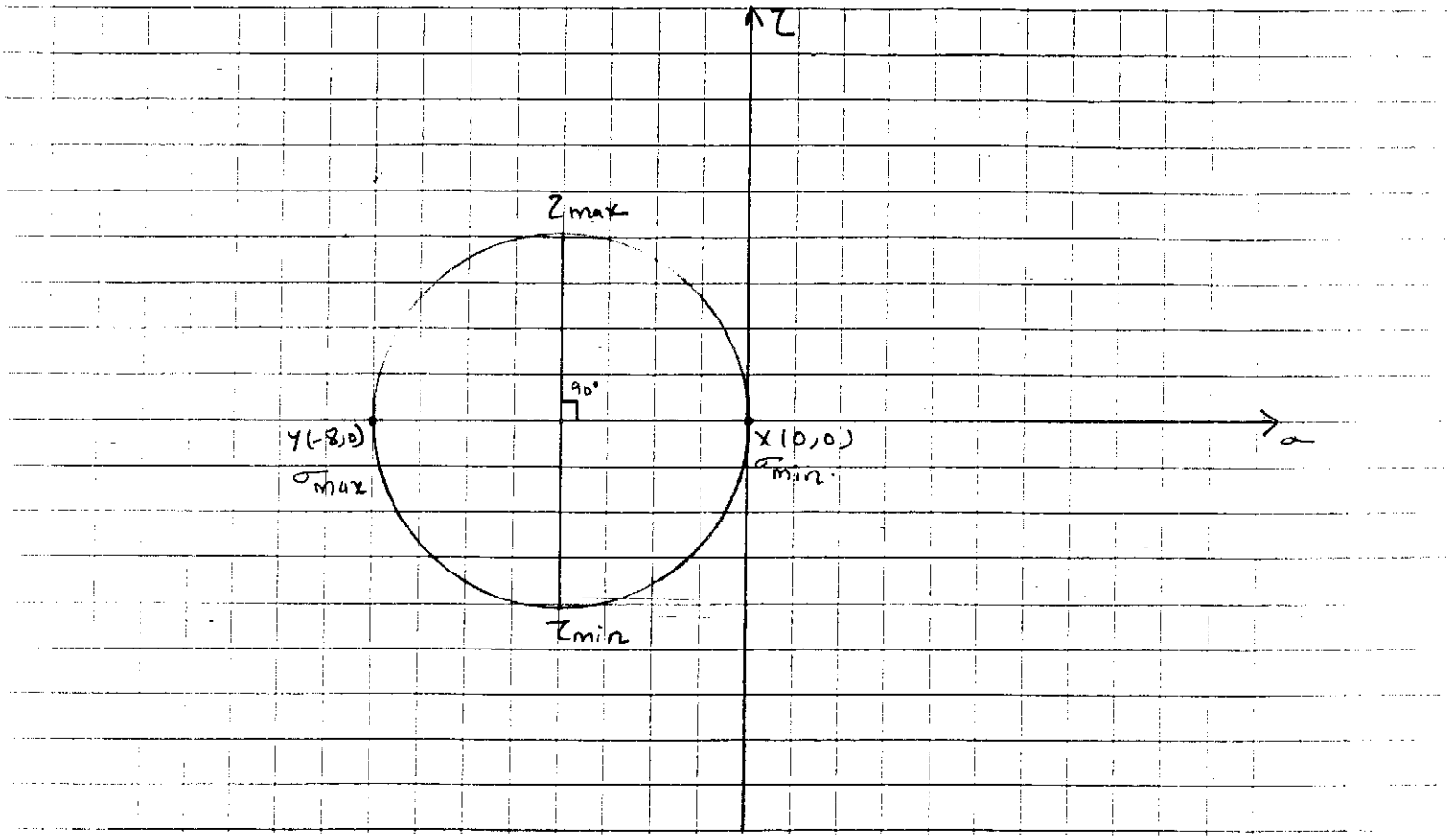
$\sigma = -4\,MPa$ (compression).

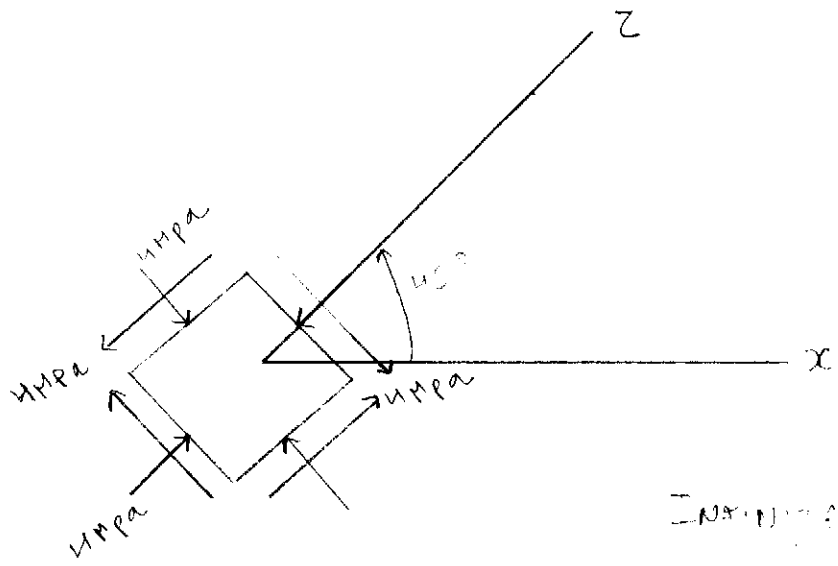


SCALE!-

X-AXIS!- [illegible]

Y-AXIS!- [illegible]





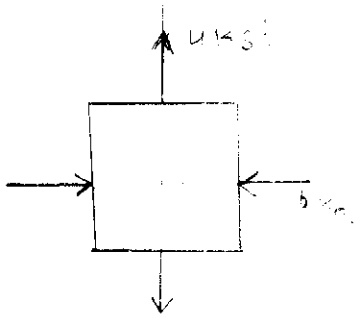
PROBLEM #3!-

Solution!- X = (-6, 0); Y = (4, 0).

(a) Principal stresses!-

$\sigma_{max} = -6$ ksi (comp.)

$\sigma_{min} = 4$ ksi (ten.).



(b) Shear stresses!-

$\tau_{max} = 5$ ksi; $\tau_{min} = -5$ ksi

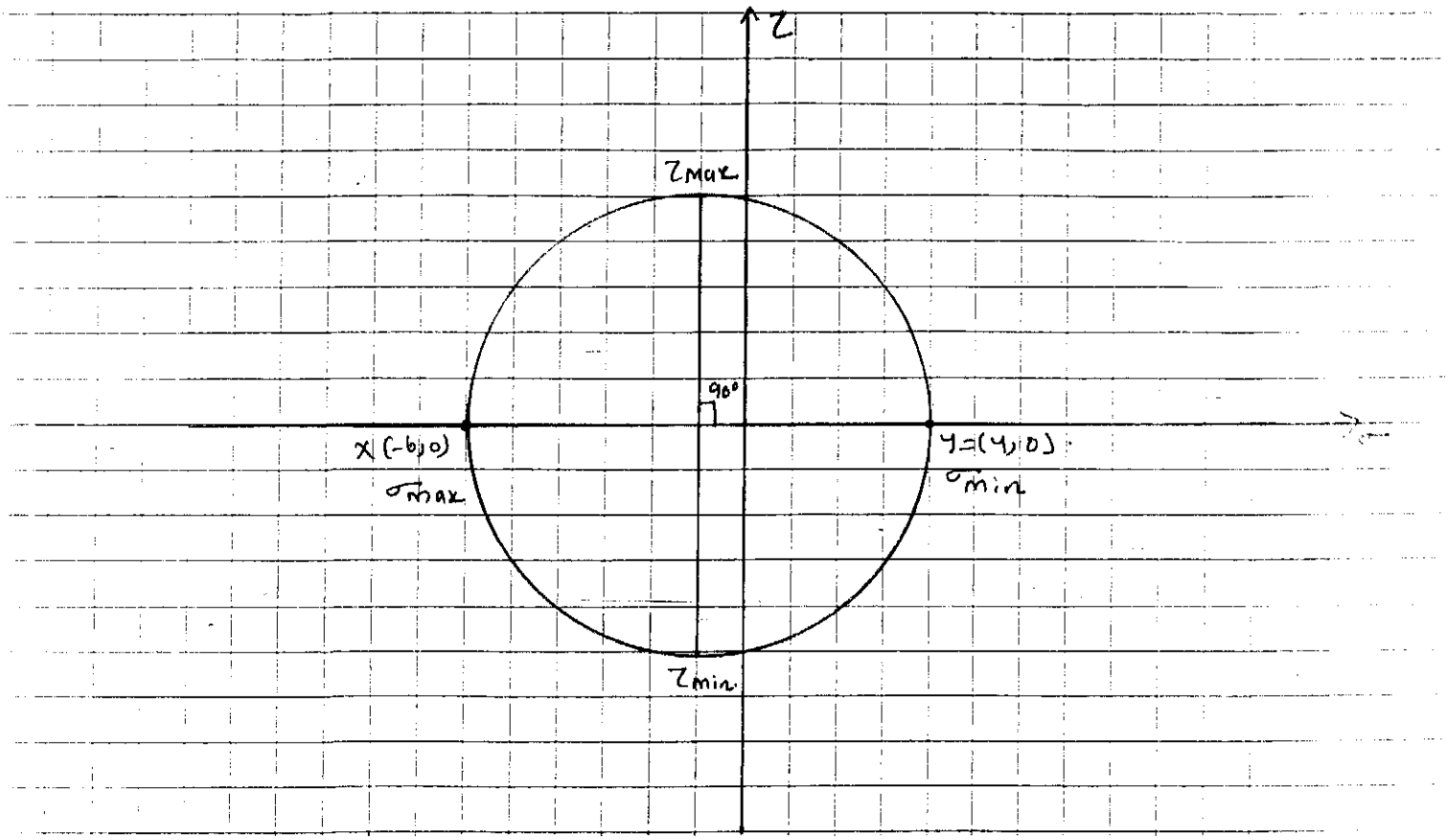
(c) Associated Normal Stresses!-

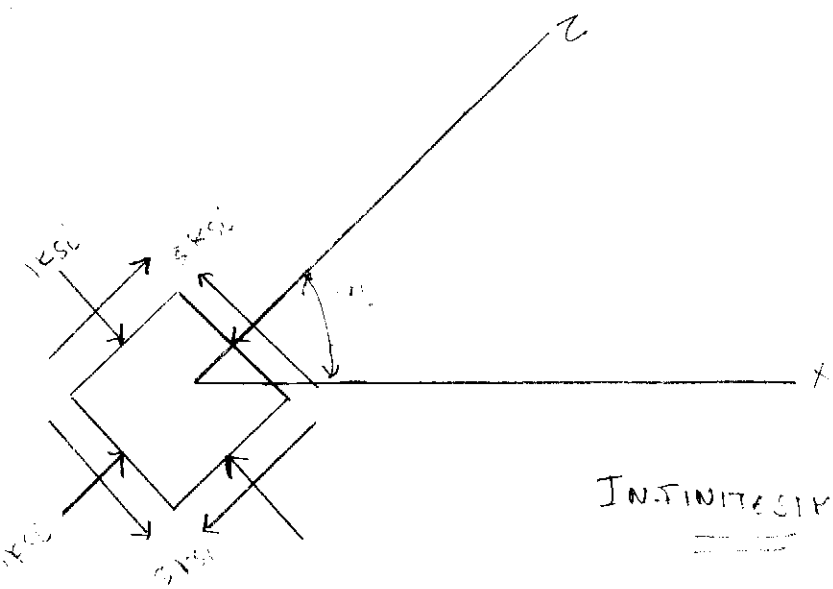
$\sigma = -1$ ksi (comp.).

SCALE!-

X-AXIS!- 1 SQUARE = 1 KSI

Y-AXIS!- 1 SQUARE = 1 KSI

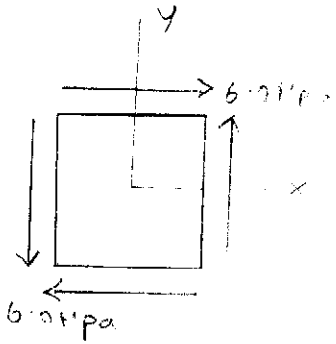




INFINITESIMAL ...

PROBLEM #(4) :-

SOLUTION :- $X = (0, -6)$; $Y = (0, 6)$



(a) Principal Stresses :-

$\sigma_{max} = 6$ MPa ; $\sigma_{min} = -6$ MPa (COMP.)

(b) Shear Stresses :-

$\tau_{max} = 6$ MPa ; $\tau_{min} = -6$ MPa

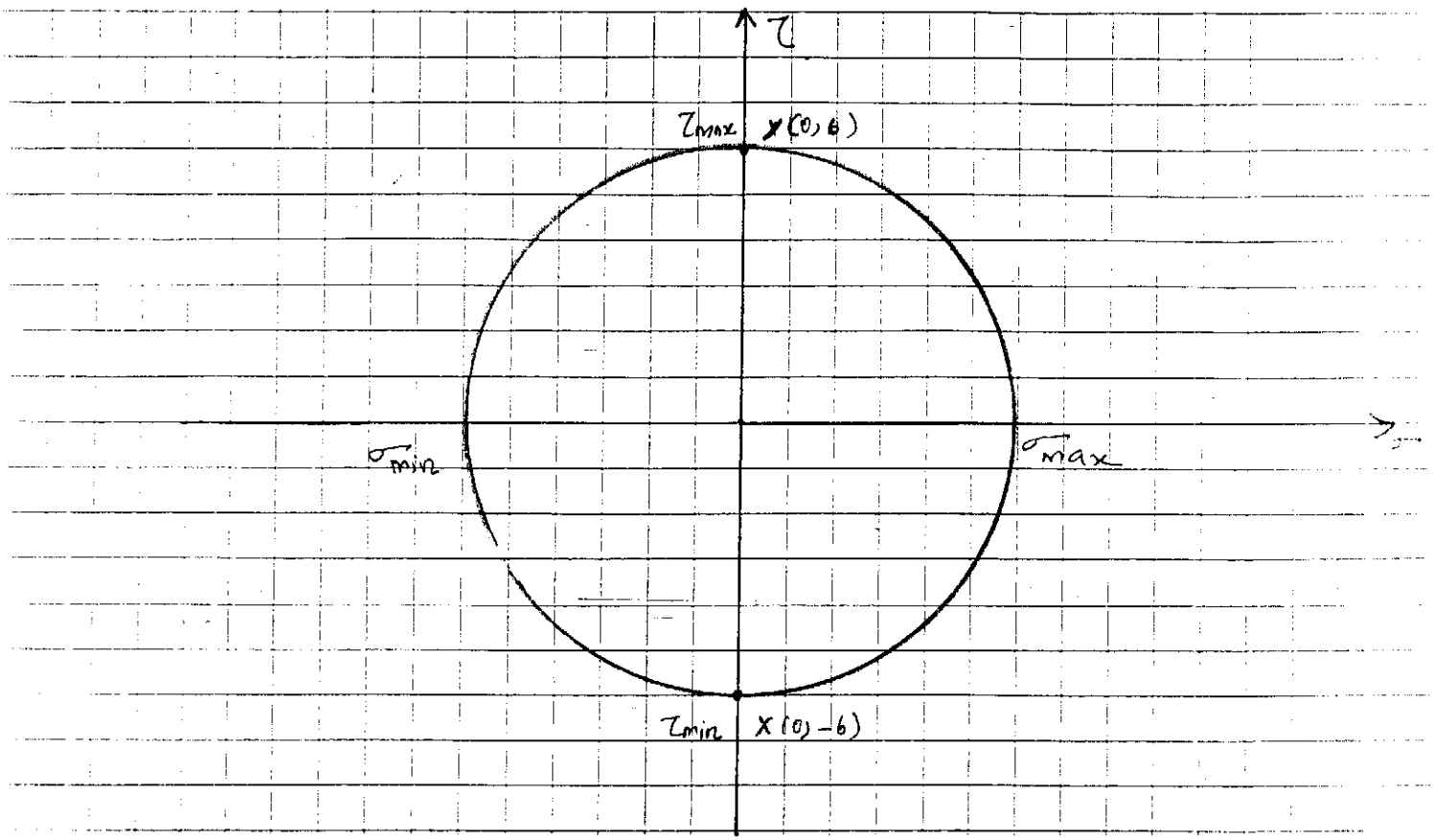
(c) Associated Normal Stresses :-

$\sigma = 0$.

SCALE :-

X - AXIS :- 1 SQUARE = [illegible]

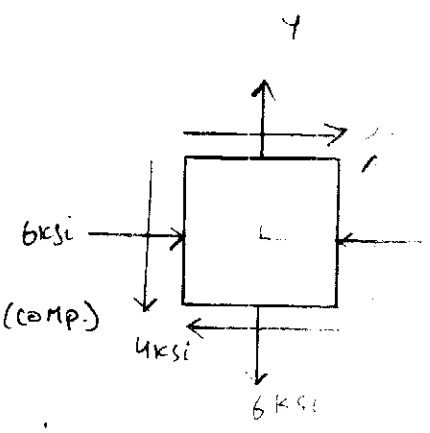
Y - AXIS :- 1 SQUARE = [illegible]



PROBLEM #(5)!-

Solution!- $X = (-6, -4)$; $Y = (6, 4)$

$$R = \sqrt{6^2 + 4^2} = 7.211$$



(a) Principal stresses!-

$\sigma_{max} = R = 7.211 ksi$; $\sigma_{min} = -R = -7.211 ksi$ (comp.)

(b) Shear Stresses!-

$\tau_{max} = R = 7.211 ksi$; $\tau_{min} = -R = -7.211 ksi$

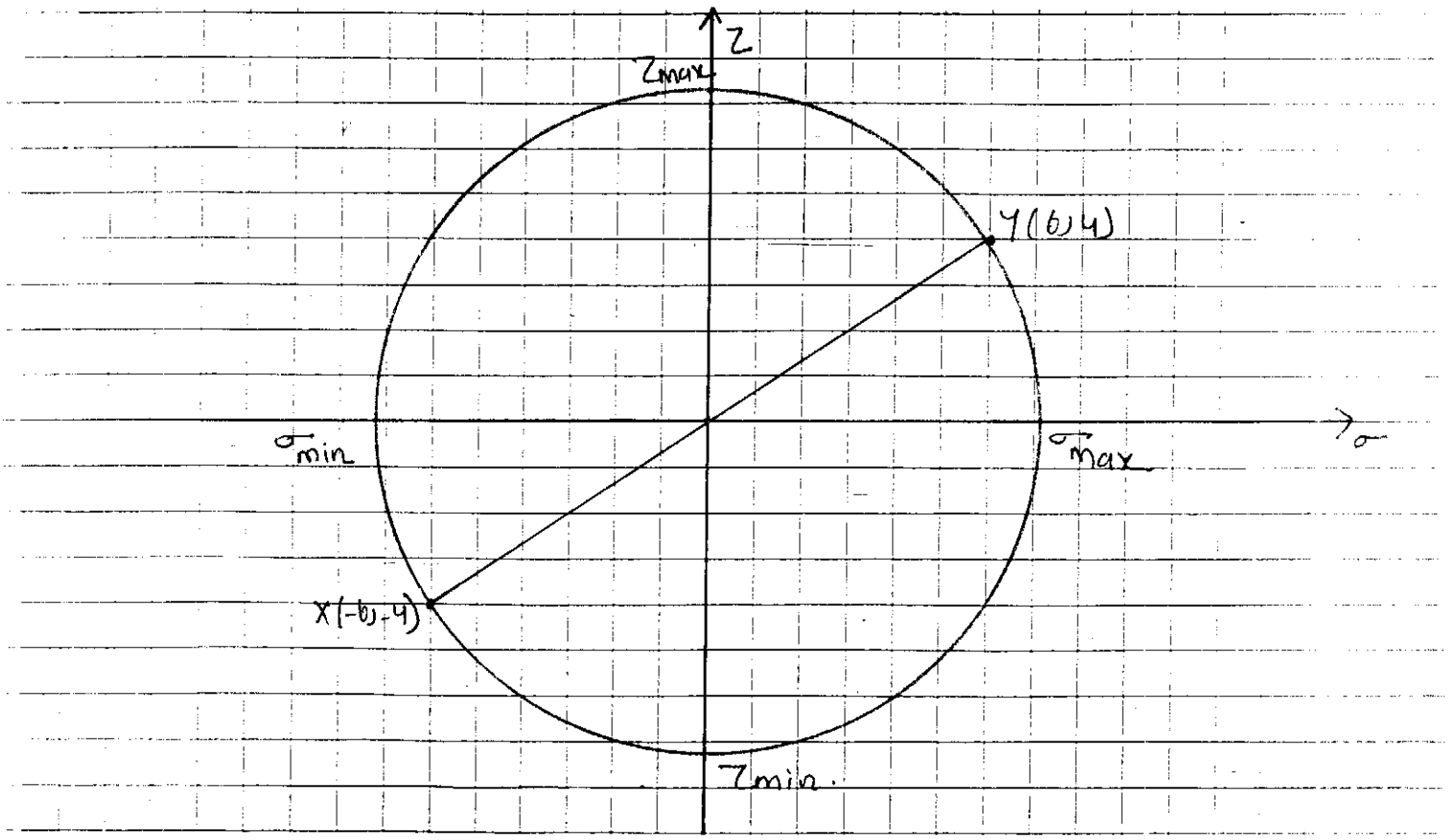
(c) Associated normal stress!-

$\sigma = 0$.

SCALE!-

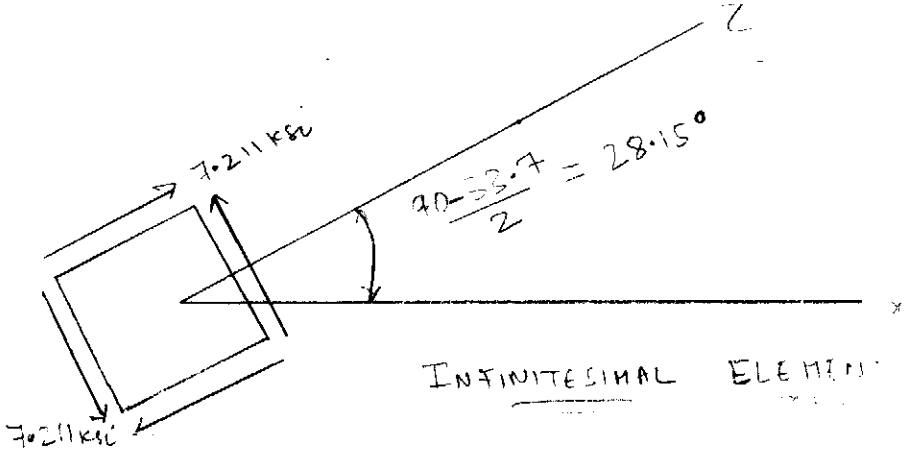
X-AXIS!- 1 SQUARE = 1 ksi

Y-AXIS!- 1 SQUARE = 1 ksi



$\tan 2\theta = \frac{4}{6}$

$\Rightarrow \theta = 16.85°$.

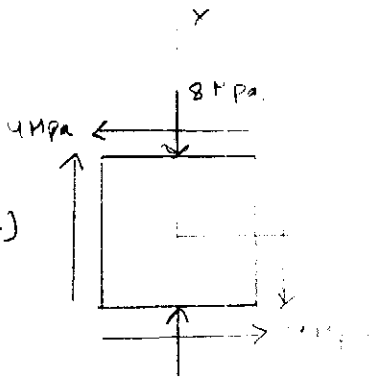


INFINITESIMAL ELEMENT

PROBLEM #⑥ :-

Solution:- $X = (0, 4)$; $Y = (-8, -4)$.

$R = \sqrt{4^2 + 4^2} = 5.657$; $\sigma_{avg} = \frac{0+8}{2} = 4$ Mpa.



(a) Principal Stresses!-

$\sigma_{max} = -(R + \sigma_{avg}) = -(5.657 + 4) = -9.657$ Mpa (comp.)

$\sigma_{min} = R - \sigma_{avg} = 5.657 - 4 = 1.657$ Mpa.

(b) Shear Stresses!-

$\tau_{max} = R = 5.657$ Mpa ; $\tau_{min} = -R = -5.657$ Mpa.

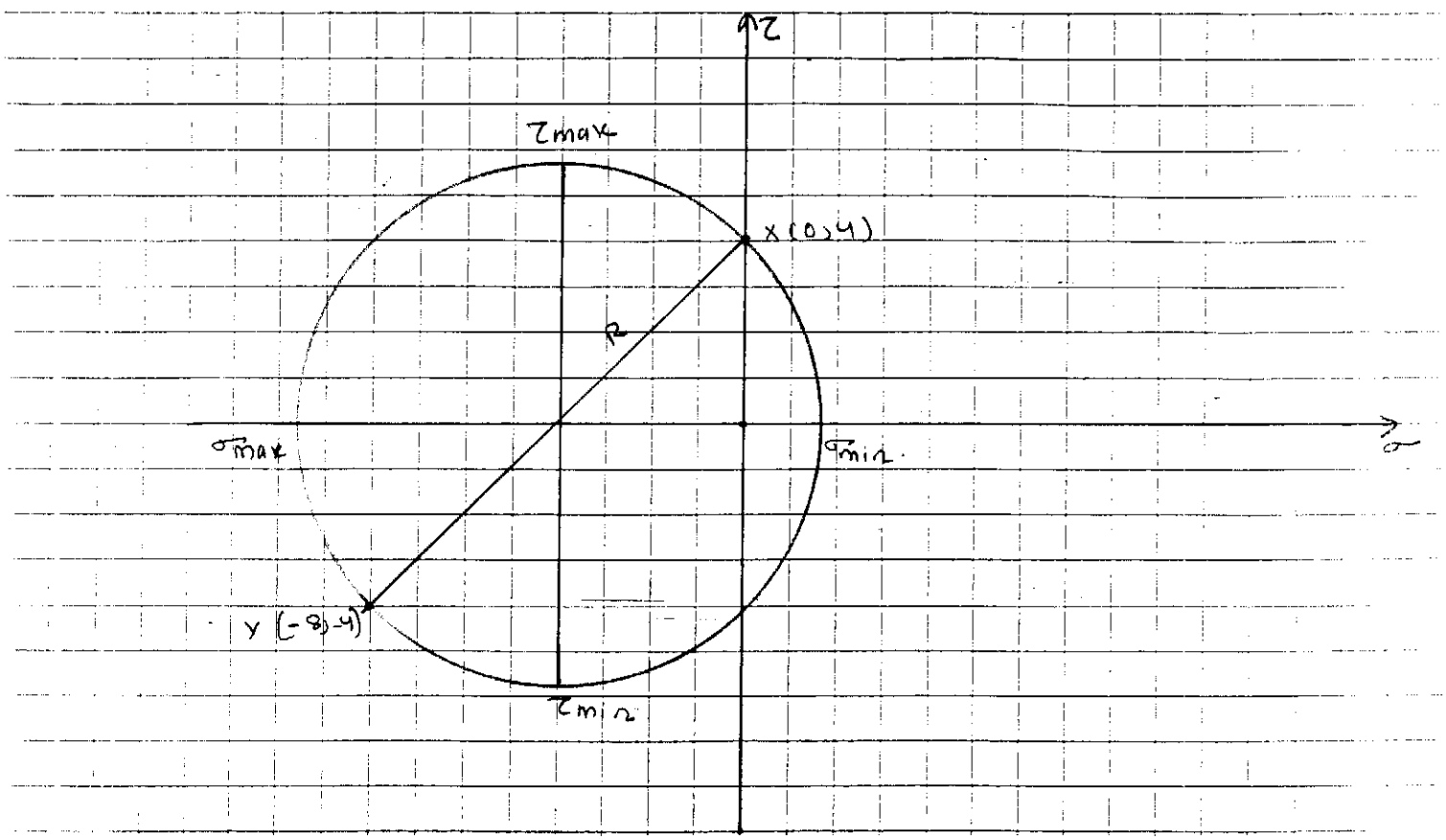
(c) Associated Normal Stresses!-

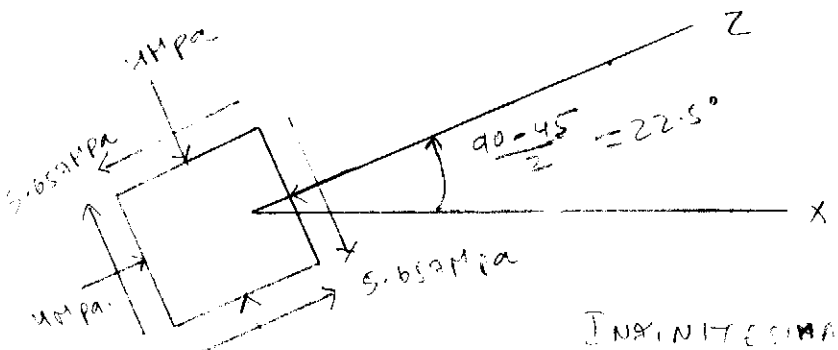
$\sigma = -4$ Mpa (comp.) & $\tan 2\theta = \frac{-4}{4} \Rightarrow \theta = -22.50°$.

SCALE!-

X-AXIS!- 1 SQUARE = [illegible] Mpa.

Y-AXIS!- 1 SQUARE = [illegible] Mpa.





INFINITESIMAL