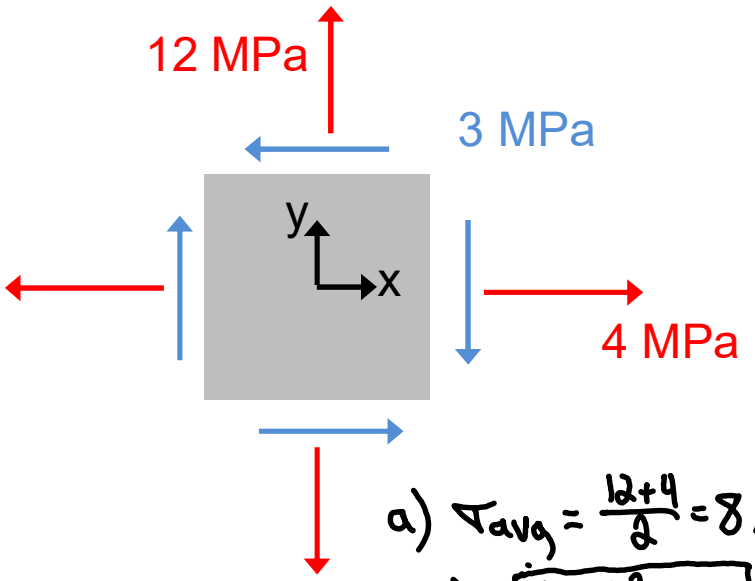
Lecture 33 Quiz: Practice with Mohr's Circles



a) Draw the Mohr's circle.
b) Determine the principal stresses.
c) Determine the in-plane maximum shear stress.
d) Determine the absolute maximum shear stress.
e) Relative to the defined ~~x~~ X axis, at what angle is the first principal stress?

a) $\sigma_{avg} = \frac{12+4}{2} = 8$ MPa

$R = \sqrt{\left(\frac{4-12}{2}\right)^2 + 3^2} = 5$ MPa

b) $\sigma_{p1} = 8+5 = 13$ MPa

$\sigma_{p2} = 8-5 = 3$ MPa

c) $\tau_{max,in\text{-}plane} = R$

$= 5$ MPa

d) Check out-of-plane Mohr's circles

$\Rightarrow \tau_{max,abs} = \frac{\sigma_{p1}}{2} = 6.5$ MPa.

e) $2\theta_{p1} = 180 - 2\theta_{p2}$

$2\theta_{p1} = 180 - \sin^{-1}\left(\frac{3}{5}\right)$

$\Rightarrow \theta_{p1} = 71.6°$ CW