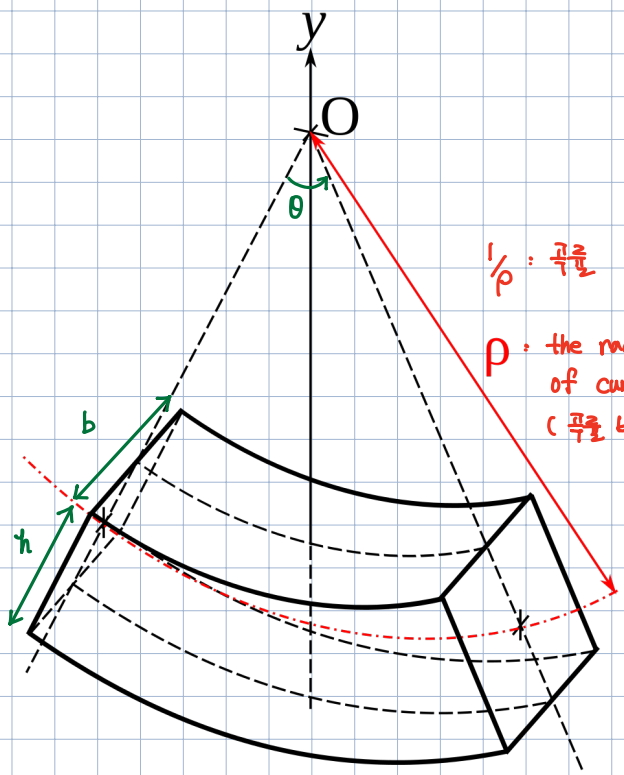
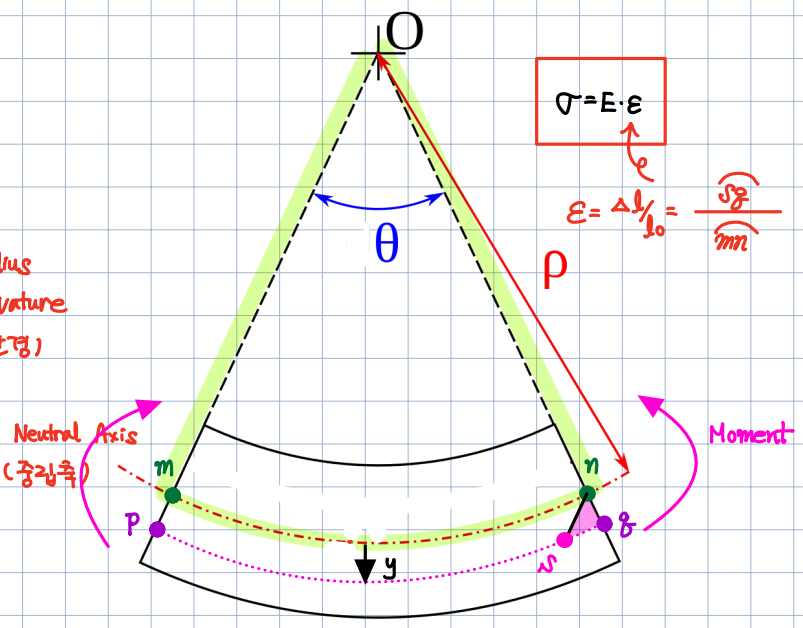
5장. Normal Stress by Bending Moment

재료역학 : 재료의 기계적 성질 → σ (Bending) → $\sigma = E\varepsilon$
기계적 구동 τ (Shear force) $\tau = G\gamma$



$1/\rho$: 곡률

ρ : the radius of curvature (곡률 반경)



$$\varepsilon = \frac{\widehat{sg}}{\widehat{mn}} \quad \text{---(1)}$$

$\rho : \widehat{mn} = \overline{ns} : \widehat{sg}$

$\widehat{mn} \cdot \overline{ns} = \rho \cdot \widehat{sg} \rightarrow \frac{\widehat{sg}}{\widehat{mn}} = \frac{\overline{ns}}{\rho} = \frac{y}{\rho}$ ---(2)

$\therefore \varepsilon = y/\rho$ Ans.

$\sigma = E\cdot\varepsilon = E\cdot y/\rho$

$dF = \sigma \cdot dA = E\cdot y/\rho \cdot dA$

$dM = dF\cdot y = E\cdot y/\rho \cdot dA \cdot y = E\cdot y^2/\rho \cdot dA$

$\int_A dM = \int_A E\cdot y^2/\rho \cdot dA = E/\rho \underbrace{\int_A y^2 dA}_{=I} = EI/\rho = M$

$M = EI/\rho$ $\quad \sigma = E\varepsilon = E\cdot y/\rho \rightarrow 1/\rho = \sigma/Ey = M/EI \rightarrow \sigma = \frac{My}{I}$ ★★★ Ans.

$1/\rho = M/EI$ $\quad 1/\rho = \sigma/Ey$

$\sigma = \frac{My}{I} = \frac{M}{I/y} = \frac{M}{Z}$

$M = \sigma\cdot Z$