CLASS 23 - SHEAR FLOW (CONT.) & SHEAR CENTER

OBJECTIVES:
1. REVIEW LAST TIME'S PROBLEM
2. UNDERSTAND SHEAR FLOW IN THIN WALLS
3. DEFINE CENTER OF SHEAR

1. REVIEW SHEAR FLOW

\[ q = \frac{V}{I} \text{ SHEAR FLOW} \]

Remember: Force per unit length

Gives us shear in longitudinal plane

But, we can use same equation to get shear flow throughout cross-sectional area

\[ q = \frac{dF}{dx} \]

If thin walled, then \[ dF = \tau dA \]

\[ = \tau \ell \, dx \]

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\[ q = \frac{\pi d x}{dx} \]

\[ q = \pi t \]

**Diagram:**

- Shear flow cancel

\[ \int q_x dy = V \]

Other cross-sections:

- Triangle
- Circle
3. SHEAR CENTER

PREVIOUSLY APPLIED SHEAR ALONG AXIS OF SYMMETRY

NON-SYMMETRIC SECTION - APPLY SHEAR AT CENTROID

MEMBER WILL TWIST CLOCKWISE

$F_f$ CAUSE MOMENT

$M = F_f \cdot d$

RESULTING IN TWIST
IF DONT WANT TO TWIST:

\[ e = \frac{F t d}{P} \]

Shear Center - Pt. of Loading WHERE BEAM ONLY BENDS → NO TWISTING