University of Idaho

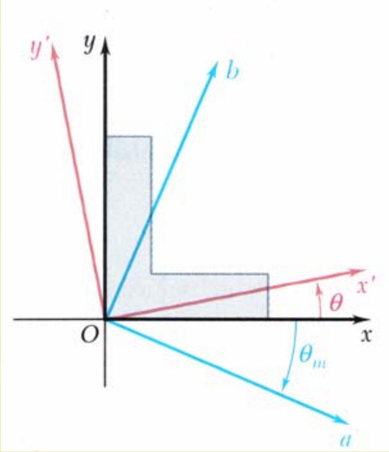
Mohr's Circle for Moment of Inertia

mechanical engineering

Mohr's circle can be used to graphically determine:

a) the principle axes and principle moments of inertia of the area about O

b) the moment and product of inertia of the area with respect to any other pair of rectangular axes x' and y' through O



Algebraic Solution Equations

I_x=Moment of inertia about x axis

I_y=Moment of inertia about y axis

I_{xy}=Product of inertia

$I'_x = I_x \cos^2\theta + I_y \sin^2\theta - 2 I_{xy} \sin\theta \cos\theta$

$I'_x = I_x \sin^2\theta + I_y \cos^2\theta + 2 I_{xy} \sin\theta \cos\theta$

$I'_{xy} = I_{xy} \cos^2\theta + 0.5\,(I_x - I_y)\sin 2\theta$

oster by: Rosanna Anderson, Jared McCombs, and Mike Thompson

Graphical Solution Path

- On x-axis $C=(I_x+I_y)/2$
- $R=\{[(I_x-I_y)/2)^2]+I_{xy}^2\}^(1/2)$
- $I_{max}=A=C+R$ & $I_{min}=B=C-R$
- Plot points (I_x, I_{xy}) & (I_y, $-I_{xy}$), and draw a line to illustrate original moment of inertia.
- Proceed with analysis as in Mohr's circle for stress to find $I_{x'}$, $I_{y'}$ and $I_{x'y'}$ at different angles.