Stress Transformation:

Similarly,

Replacing *θ* in Eqn. (i) by *θ+900* gives the normal stress in the direction of the *y'* axis. This stress is given as:

Principal Stresses in 2D problem:

To find the plane for a maximum or a minimum normal stress, Eqn. (i) is differentiated wrt *θ* and the derivative is set to zero.

Two roots / double angle:

Important Conclusion: On planes on which the maximum or minimum normal stresses occur, there are no shear stresses. These planes are called the principal planes of stress, and the stresses acting on these planes are called the principal stresses.

Magnitudes of the principal stresses:

Maximum shear stresses in 2D problems:

Differentiating Eqn. (ii) wrt θ and setting the derivative to zero:

Similar substitution:

Mohr’s Circle of Stress for 2D problems: