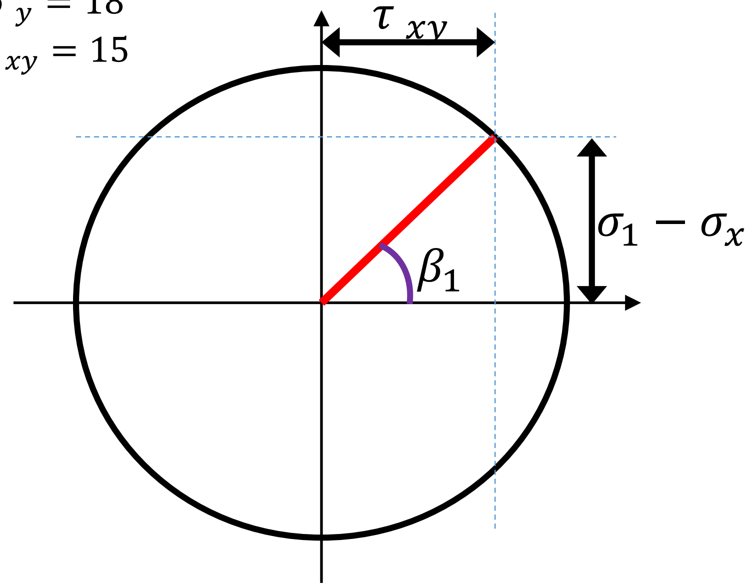
Find principal angle using $\tan(\theta) = \left(\frac{\sigma_1 - \sigma_x}{\tau_{xy}}\right)$

$\sigma_x = -12$
$\sigma_y = 18$
$\tau_{xy} = 15$

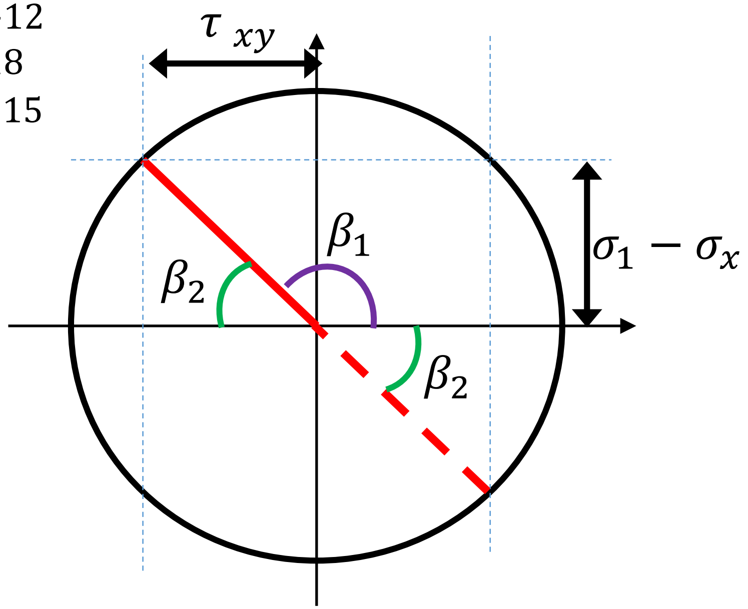


Since $\sigma_1 - \sigma_x > 0$ and $\tau_{xy} > 0$, the angle β_1 is on the first quadrant and therefore "atan" and "atan2" yield the same result

$$\theta_{p1} = \beta_1 = atan\left(\frac{\sigma_1 - \sigma_x}{\tau_{xy}}\right) = 67.5^o$$

$$\theta_{p1} = \beta_1 = atan2(\sigma_1 - \sigma_x, \tau_{xy}) = 67.5^o$$

$\sigma_x = -12$
$\sigma_y = 18$
$\tau_{xy} = -15$



Since $\sigma_1 - \sigma_x > 0$ and $\tau_{xy} < 0$, the angle β_1 is on the second quadrant.

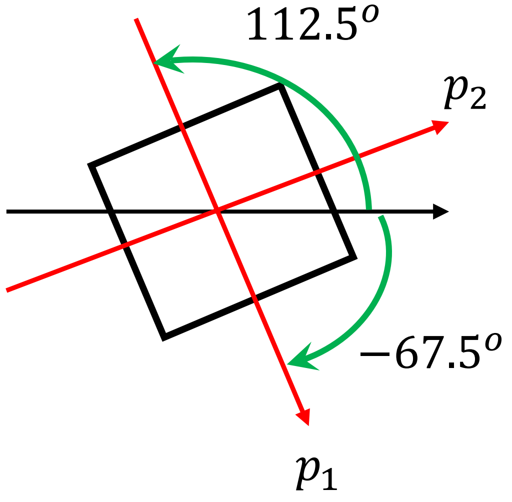
"atan" gives an angle in the range $[-\frac{\pi}{2}, \frac{\pi}{2}]$:

$$\theta_{p1} = \beta_2 = atan\left(\frac{\sigma_1 - \sigma_x}{\tau_{xy}}\right) = -67.5^o$$

"atan2" gives the angle in the correct quadrant (here the second quadrant):

$$\theta_{p1} = \beta_1 = atan2(\sigma_1 - \sigma_x, \tau_{xy}) = 112.5^o$$

$\sigma_x = -12$
$\sigma_y = 18$
$\tau_{xy} = -15$

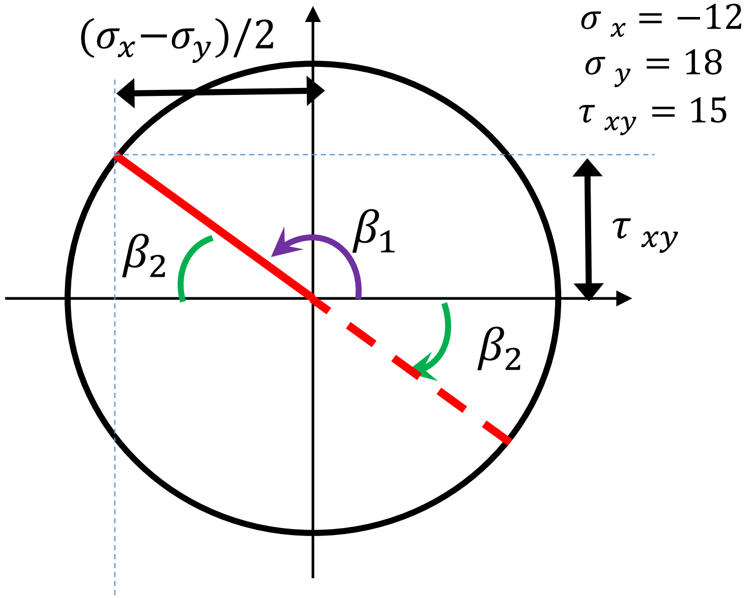


Note that when using the expression,

$$\tan(\theta) = \left(\frac{\sigma_1 - \sigma_x}{\tau_{xy}}\right)$$

Both "atan" and "atan2" yield the same result.

Find principal angle using $\tan(2\theta) = \left(\frac{2\,\tau_{xy}}{\sigma_x - \sigma_y}\right)$



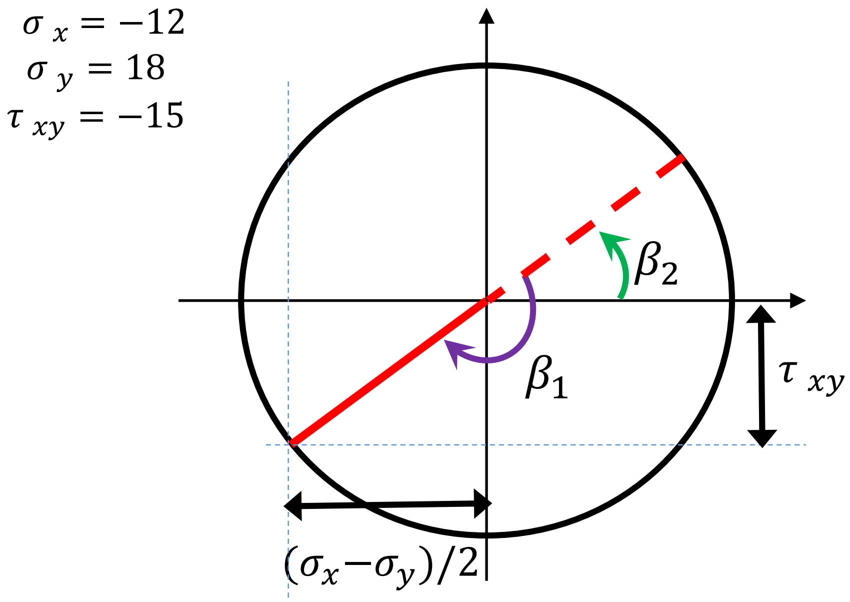
Since $\frac{\sigma_x - \sigma_y}{2} < 0$ and $\tau_{xy} > 0$, the angle β_1 is on the second quadrant.

"atan" gives an angle in the range $[-\frac{\pi}{2}, \frac{\pi}{2}]$:

$$\theta_{p2} = \frac{\beta_2}{2} = 0.5\, atan\left(\frac{2\,\tau_{xy}}{\sigma_x - \sigma_y}\right) = -22.5^o$$

"atan2" gives the angle in the **correct quadrant** (here the second quadrant):

$$\theta_{p1} = \frac{\beta_1}{2} = 0.5\, atan2(2\tau_{xy}, \sigma_x - \sigma_y) = 67.5^o$$



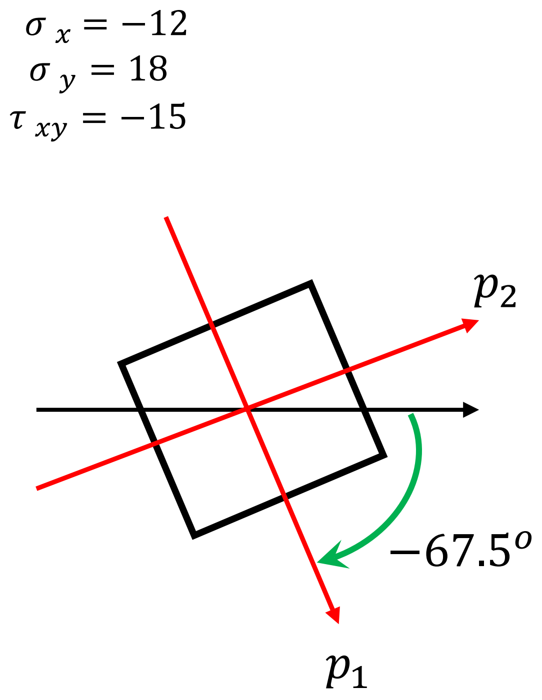
Since $\frac{\sigma_x - \sigma_y}{2} < 0$ and $\tau_{xy} < 0$, the angle β_1 is on the third quadrant.

"atan" gives an angle in the range $[-\frac{\pi}{2}, \frac{\pi}{2}]$:

$$\theta_{p2} = \frac{\beta_2}{2} = 0.5\, atan\left(\frac{2\,\tau_{xy}}{\sigma_x - \sigma_y}\right) = 22.5^o$$

"atan2" gives the angle in the correct quadrant (here the third quadrant):

$$\theta_{p1} = \frac{\beta_1}{2} = 0.5\, atan2(2\tau_{xy}, \sigma_x - \sigma_y) = -67.5^o$$



Note that when using the expression,

$$\tan(2\theta) = \left(\frac{2\,\tau_{xy}}{\sigma_x - \sigma_y}\right)$$

Only "atan2" gives the result in the correct quadrant