0.0.1 Example: Tension strip with circular hole

Stress distribution in polar coordinates

$$\begin{aligned}
\sigma_r &= \tfrac{1}{2}\,\sigma_0 \left\{ \left[1 - (\frac{a}{r})^2\right] + \left[1 + 3(\frac{a}{r})^4 - 4\,(\frac{a}{r})^2\right] \cos 2\theta \right\} \\
\sigma_\theta &= \tfrac{1}{2}\,\sigma_0 \left\{ \left[1 + (\frac{a}{r})^2\right] - \left[1 + 3(\frac{a}{r})^4\right] \cos 2\theta \right\} \\
\tau_{r\theta} &= -\tfrac{1}{2}\,\sigma_0 \left\{ 1 - 3(\frac{a}{r})^4 + 2(\frac{a}{r})^2 \right\} \sin 2\theta
\end{aligned}$$

Displacements in polar coordinates

$$\begin{aligned}
u_r &= \frac{\sigma_0 r}{2E} \left\{ \left[1 + (\frac{a}{r})^2\right] + \left[1 - (\frac{a}{r})^4 + 4(\frac{a}{r})^2\right] \cos 2\theta + \nu \left[1 - (\frac{a}{4})^2\right] - \nu \left[1 - (\frac{a}{r})^4\right] \cos 2\theta \right\} \\
u_\theta &= \frac{\sigma_0 r}{2E} \left\{ \left[1 + (\frac{a}{r})^4 + 2(\frac{a}{r})^2\right] + \nu \left[1 + (\frac{a}{4})^4 - 2(\frac{a}{r})^2\right] \right\} \sin 2\theta
\end{aligned}$$