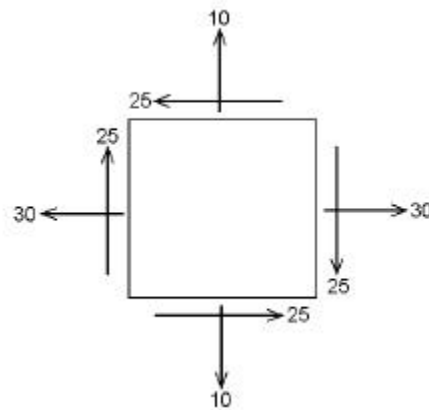


Example 1

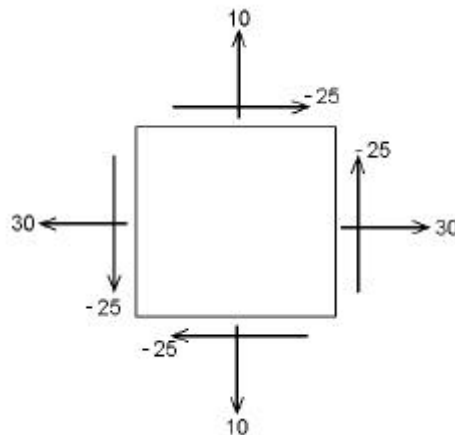
At a certain point in a component the stresses are:

$$\sigma_x = 30 \text{ MPa tensile, } \sigma_y = 10 \text{ MPa tension and } \tau_x = 25 \text{ MPa clockwise.}$$

Plot the variation of stresses on the plane, defined by ϕ , through the range $\phi = 0^\circ$ to 360° .



Using out convention, this becomes:



i.e. $\sigma_x = +30$ $\sigma_y = +10$ $\tau_x = -25$

From equations (2) and (3):-

$$\sigma_\phi = 20 + 10 \cos 2\phi - 25 \sin 2\phi$$

$$\tau_\phi = -10 \sin 2\phi - 25 \cos 2\phi$$

These yield the data:

ϕ	$\sigma\phi$	$\tau\phi$
0	30	-25
10	20.8	-26.9
20	11.6	-25.6
30	3.3	-21.2
40	-2.9	-14.2
50	-6.4	-5.5
60	-6.7	3.8
70	-3.7	12.7
80	2.1	20.1
90	10	25
100	19.2	26.9
110	28.4	25.6
120	36.7	21.2
130	42.9	14.2
140	46.4	5.5
150	46.7	-3.8
160	43.7	-12.7
170	37.9	-20.1
180	30	-25

Stress variation in the plane of phi

