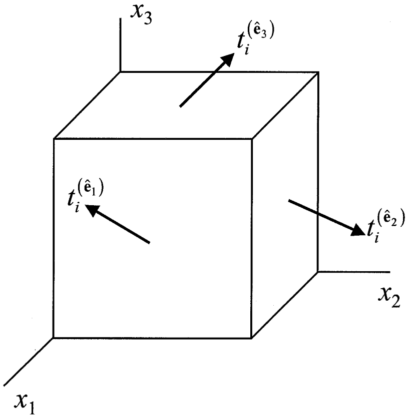

FIGURE P3.6
Stress vectors represented on coordinate cube.

(c) the component of the stress vector in the direction of the normal
(d) the angle in degrees between the stress vector and the normal.

Answer: (a) $\mathbf{t}^{(\hat{\mathbf{n}})} = -5\hat{\mathbf{e}}_1 + 11\hat{\mathbf{e}}_2 - 2\hat{\mathbf{e}}_3$

(b) $\mathbf{t}^{(\hat{\mathbf{n}})} = \sqrt{150}$

(c) $\frac{23}{9}$

(d) 77.96°

3.5 Let the stress tensor components at a point be given by $\sigma_{ij} = \pm\sigma_o n_i n_j$ where σ_o is a positive constant. Show that this represents a uniaxial state of stress having a magnitude $\pm\sigma_o$ and acting in the direction of n_i.

3.6 Show that the sum of squares of the magnitudes of the stress vectors on the coordinate planes is independent of the orientation of the coordinate axes, that is, show that the sum

$$t_i^{(\hat{\mathbf{e}}_1)} t_i^{(\hat{\mathbf{e}}_1)} + t_i^{(\hat{\mathbf{e}}_2)} t_i^{(\hat{\mathbf{e}}_2)} + t_i^{(\hat{\mathbf{e}}_3)} t_i^{(\hat{\mathbf{e}}_3)}$$

is an invariant.

3.7 With respect to axes $Ox_1x_2x_3$ the stress state is given in terms of the coordinates by the matrix

$$\left[\sigma_{ij}\right] = \begin{bmatrix} x_1x_2 & x_2^2 & 0 \\ x_2^2 & x_2x_3 & x_3^2 \\ 0 & x_3^2 & x_3x_1 \end{bmatrix}$$