Objectives:

- Evaluate moments in 2D and 3D problems
- Obtain resultant forces and moments for equivalent systems.

1) Draw the forces and resulting moment that acts on a wrench when unfastening a nut.

2) Sketch a diagram of the forces and moments acting on a bottle opener.
3) Use Figure 1 to determine the moment of the force about point \( O \) using the scalar formulation.

4) Use Figure 2 and the force \( \mathbf{F} = 300\mathbf{i} - 200\mathbf{j} + 150\mathbf{k} \) to determine: (a) the moment of the force about point \( O \) using the vector formulation, and (b) the moment of the same force about the x-axis.
5) Using Figure 3, determine the magnitude of $F$ so that the resultant couple moment is 600 lb.ft counterclockwise. Where on the beam does the resultant couple moment act?
6) Replace the force system acting on the beam in Figure 4 by: (a) an equivalent force and couple moment at point O, and (b) an equivalent force distance $x$ to the right of $O$. Sketch your equivalent system on the right side of Figure 4.