**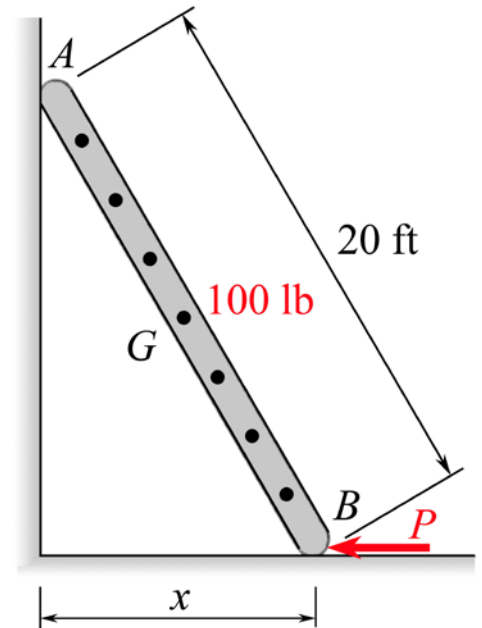1.** ③ Define (*a*) *work of a force* on a body, (*b*) *work of a moment* on a body, (*c*) location of *displacement center* of a body.

**2.** ⑦ A 20-ft ladder weighing 100 lb with its center of gravity at its midpoint *G* is kept from sliding by a 16-lb horizontal force **P** acting at its end *B* as shown. Neglecting friction forces at supports *A* and *B*, determine the distance *x*.



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**1.** (*a*) *Work of a force* on a body is equal to the force on the body times the displacement of the body in the direction of the force. ① (*b*) *Work of a moment* on a body is equal to the moment on the body times the angular displacement of the body in the direction of the moment. ① (*c*) The *displacement center* of a body is located at the point of intersection of two straight lines that are drawn through two different points of the body and are perpendicular to the virtual displacement vectors of those two points, respectively. ①

**2.** **Step 1:** Draw the *FBD* of the ladder. ②

**Step 2:** Draw the *VDD* of the ladder with a *strategy*, which allows the unknown parameter *x*, but *no* other unknowns, to be involved in the total virtual work done. ③

**Step 3:** Refer to the *FBD* and *VDD* to set $\delta U = 0$ to obtain

$$100\left(\frac{x}{2}\delta\theta\right) + 16\left(-\sqrt{400-x^2}\,\delta\theta\right) = 0 \quad x = 6.0955 \quad \boxed{x = 6.10 \text{ ft}} \ ②$$