We determined the viscosity $\eta$ and the thermal conductivity of argon at zero density with the uncertainty of only 0.038% in the temperature range 200 K to 400 K. Our results will improve: (1) the argon-argon interatomic potential, (2) calculated boundary-layer corrections for primary acoustic thermometry, and (3) calibrations of laminar flow meters as well as instruments for measuring transport properties. At 298.15 K, we determined the ratio $\eta_{\text{argon}}/\eta_{\text{helium}} = 1.13800/\pm 0.00018$ by measuring the flow rate of these gases through a quartz capillary of known dimensions and simultaneously measuring the pressures at the ends of the capillary. Between 200 K and 400 K, we used a two-capillary viscometer to determine $\eta_{\text{argon}}/\eta_{\text{helium}} = 1.21167 - 0.82034 \exp(T/123.78 \text{ K})$ with an uncertainty of 0.023%. From $\eta_{\text{argon}}/\eta_{\text{helium}}$, we computed $\eta_{\text{argon}}$ using the values of $\eta_{\text{helium}}$ calculated ab initio. (For new \textit{ab initio} calculations, see Hurly et al., this meeting.) Finally, we computed the thermal conductivity of argon with an uncertainty of 0.038% from $\eta_{\text{argon}}$ and values of the Prandtl number computed from various argon-argon interatomic potentials. Our values for $[\eta(T)/\eta(298 \text{ K})]_{\text{helium}}$ range from 0.77 to 1.21; they differ from those calculated \textit{ab initio} by, at most, 0.0004. This small difference is consistent with the uncertain thermal expansion of the nickel capillaries of our two-capillary viscometer.