Consider each of the following charge distributions. In each case, suppose you want to find the magnitude of the electric field for points along the $x$-axis, as a function of $x$.

For which of these cases would you want to use Gauss’ law?

(a) A uniformly charged solid insulating sphere (total charge $Q$) of radius $R$, centered at the origin.

(b) A charged solid insulating sphere of radius $R$ centered at the origin, where the charge density varies with the distance $r$ from the center according to:

$$
\rho(r) = \rho_0 \left(1 - \frac{r}{R}\right)
$$

where $\rho_0$ is the charge density at the center.

(c) A charged solid insulating sphere of radius $R$ centered at the origin, where the charge density varies with the coordinate $x$:

$$
\rho(x) = \rho_0 \left(1 - \frac{|x|}{R}\right)
$$

where $\rho_0$ is the charge density at the center, but that the charge density does not depend on the $y$ or $z$ coordinate.

(d) A uniformly charged solid insulating cube of side $L$ and total charge $Q$, with one corner at the coordinate origin, and the other corner at $(x, y, z) = (L, L, L)$.

(e) A uniformly charged solid insulating cube of side $L$ and total charge $Q$, with the center of the cube at the origin, and the coordinate axes aligned perpendicular to the cube faces.

(f) A uniformly charged solid insulating rod of length $L$ and total charge $Q$. Suppose the center of the rod is at the coordinate origin, and the rod is aligned with the $x$-axis.