Charge conservation in metals: dynamics

Suppose you dump some charge into the bulk of a metal at t=0.
What happens next?

1) Start with the continuity equation:

$$\nabla \cdot \vec{J} =$$

2) Use Ohm's law for the current density, to get

$$\nabla \cdot \underline{\qquad\qquad} =$$

3) Assume the material is homogeneous (pull constants out of the derivative) so…

$$\underline{\quad} \nabla \cdot \underline{\qquad\qquad} =$$

4) Apply Gauss' law in that last equation to simplify it
(We can't automatically assume ρ=0 inside a metal if we just DUMPED charge into it!)

5) You should have a first order differential equation. Can you solve it by inspection?

What do you conclude about the charge density inside the metal as time goes by?
(What is happening physically?)