Magnetic field lines cannot break or change connections when they evolve ideally, $\partial\vec{B}/\partial t = \vec{\nabla}\times(\vec{u}\times\vec{B})$ with $\vec{u}(\vec{x},t)$ their velocity. Nevertheless, magnetic fields during tokamak disruptions or in nature prevalently evolve into a state of fast magnetic reconnection, which means with an Alfvénic, not a resistive, reconnection rate.

1. Why does the near-ideal evolution of natural and laboratory magnetic fields robustly lead to states of fast magnetic reconnection independent of the drive and of the initial state?
2. What is the characteristic time required to reach a state of fast magnetic reconnection?
3. What is the explanation of the effects produced by fast magnetic reconnection, which are primarily associated with magnetic helicity conservation and an energy transfer from the magnetic field to the plasma?
4. Why does the Alfvén speed define the time scale during which these effects occur?

All four questions can be robustly answered by solving for the evolution of a magnetic field using the Lagrangian coordinates $\partial\vec{x}(\vec{x}_0,t)/\partial t = \vec{u}_\perp$, where $\vec{x}(\vec{x}_0,0) = \vec{x}_0$. Using singular value decomposition, the Jacobian matrix can be written as $\partial\vec{x}/\partial\vec{x}_0 = \hat{U}\Lambda_u\hat{u} + \hat{M}\Lambda_m\hat{m} + \hat{S}\Lambda_s\hat{s}$, using two sets of orthonormal unit vectors. Either naturally or after being subjected to a small perturbation, the singular values of $\vec{u}_\perp$ have the time dependencies that Λ_u increases exponentially, Λ_s decreases exponentially, and Λ_m is much slower varying. The exact solution of the ideal evolution equation is $\vec{B} = \frac{\hat{u}\cdot\vec{B}_0}{\Lambda_m\Lambda_s}\hat{U} + \frac{\hat{m}\cdot\vec{B}_0}{\Lambda_u\Lambda_s}\hat{M} + \frac{\hat{s}\cdot\vec{B}_0}{\Lambda_u\Lambda_m}\hat{S}$, where $\vec{B}_0$ is the initial magnetic field. For reconnection in which the magnetic field strength does not exponentiate towards infinity, the field line velocity must rotate so $\hat{u}\cdot\vec{B}_0 = 0$. This constraint allows one to show the parallel current increases only slowly, as Λ_m^2, while the non-ideal part of the field $\delta\vec{B}_{ni}$ increases with exponential speed, as Λ_u times a term proportional to the non-ideal part of $\vec{E}$.