Extra Credit #1 (optional)

1. What type of motion is relative in General Relativity that was absolute in Special Relativity? What types of motion are absolute in both General Relativity and Special Relativity?

2. To describe spacetime geometry, we need a *metric field* (which tells us how to measure distances between points). To describe gravity, we need a *gravitational field* (which tells us how objects behave under the influence of gravity). Prior to General Relativity, metric fields were considered *purely mathematical* devices that don't exist in nature. Gravitational fields were considered *purely physical* objects that do exist in nature (like other physical fields such as the electromagnetic field). What does geometrizing the gravitational field entail about its ontological status (real physical object or mathematical device) and that of the metric field?

3. Explain in your own words how the curvature of a space can be defined in terms of the behavior of tangent vectors moving along closed paths in the space. (This motivates the definition of the "curvature tensor".)

4. Explain in your own words what the Einstein equations represent. What do you have to do initially in order to solve them?