PHYS 503/629 – HOMEWORK No. 2 – DUE TUESDAY, 4/12/2005

Problem 1. Problem 9.12 of Hartle's book.

Problem 2. Problem 9.18 of Hartle's book.

Problem 3. Problem 10.1 of Hartle's book.

Problem 4. (Only for 629 level) Show that $r = 0$ is a true singularity of the Schwarzschild solution and $r = 2M$ is a coordinate singularity by computing the curvature invariant $R_{\mu\nu\rho\sigma}R^{\mu\nu\rho\sigma}$ (Kretschmann scalar). Together with $R = 0$ and $R_{\mu\nu}R^{\mu\nu} = 0$, the regularity of the Kretschmann invariant at $r = 2M$ shows that the curvature is finite at the black hole horizon, and therefore the spacetime is regular there.