

## Problem set 4, due in on Monday March 23.

### Thin discs.

a. Make a calculation necessary for producing the spectral plot in Fig. 5.2 of the text, and make your own plots.

b. Consider a 10 solar mass non-rotating black hole accreting from a thin disc (which terminates at 3 Schwarzschild radii,  $6GM/c^2$ ). The accretion disc is radiating a fraction  $m$  of the eddington luminosity. Assume that the disc is made of fully ionized hydrogen, and that the opacity is due to Thompson scattering. Find, as a function of  $m$  the radius  $r_t$  where the disc makes a transition from the inner radiation-pressure-dominated part to the outer gas-pressure dominated part. Find the scaleheight of the radiation-pressure dominated part. At what value of  $m$  does the thin-disk approximation break down at the disc's inner edge?