Compact Object Problem Set

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1question worth 10 points

1a) Calculate the gravitational redshift $\lambda/\lambda o$ from the surface of a 1 solar mass white dwarf if the radius of the white dwarf is 1000 km

b) The relativistic doppler shift for a object moving at speed v is

$$\lambda/\lambda o = [(1 + v/c)/(1-v/c))]^{1/2}$$

How fast would an object have to be moving for the relativistic doppler shift to be equal to the gravitational redshift in part (a)?

c) If you observe a redshifted spectral line from an object, how could you distinguish whether the redshift is due to an intense gravitational field, or due to the bulk motion of the object?