PHY105 Problems 2

1. What is the difference between an *achromatic* and an *apochromatic* lens?
2. What is the *Rayleigh criterion*? What property of a telescope does the Rayleigh criterion describe?
3. The quadruple system ν Scorpii is a “double-double”: it has two relatively widely separated components each of which is itself a closer binary. The separations are as follows:
   * ν Sco A and ν Sco C are separated by 41";
   * ν Sco A and ν Sco B are separated by 1.3";
   * ν Sco C and ν Sco D are separated by 2.3".

If you have an 80 mm aperture *f*/10 refractor, how many stars will you see if you look at the ν Sco system? Is your answer likely to be affected by the fact that ν Sco D (apparent magnitude 8.0) is much fainter than ν Sco C (6.3)? (Assume that your eyes’ sensitivity peaks at about 550 nm when dark-adapted. State any other assumptions that you make.)

1. You are aboard an aircraft flying from Amsterdam Schiphol (longitude 4° 45' 50" E, latitude 52° 18' 31" N) to Tokyo Narita (140° 23' 27" E, 35° 45' 50" N). Assume that the Earth is spherical and that the aircraft takes a great circle route.
   1. What is the total distance that you fly in nautical miles?
   2. In what direction does your aircraft set off from Schiphol?
   3. What are the coordinates (latitude and longitude) of the furthest north point that you fly over? (Hint: in what direction are you flying when you pass over that point?)
2. You fly from London Heathrow (0° 27' 41" W, 51° 29' 14" N) to Sydney (151° 10' 38" E,   
   33° 56' 46" S) on a great circle route.
   1. What is the total distance that you fly in nautical miles?
   2. In what direction does your aircraft set off from Heathrow?