6.10: Problems

In Section 3.5 of Chapter 5, I suggested that it might be a good ides to write a computer program, which would last you for life, that would solve any problem involving plane or spherical triangles. If you did that, the following problems will be easy. If you didn't, you are now about to suffer.

6.10.1

The equatorial coordinates (J2000.0) of Antares and Deneb are, respectively

Antares $\alpha = 16^{\mathrm{h}}29^{\mathrm{m}}.5$ $\delta = -26^{\circ}\ 26'$
Deneb 20 37.6 +45 17

Calculate the positions of the poles of the great circle joining these two stars.

I put one star in the northern hemisphere, and the other in the south, and I put the stars in the third and fourth quadrants of right ascension, just to be awkward.

6.10.2

The parallax of Antares is $0''.00540$, and the parallax of Deneb is $0''.00101$. How far apart are the stars (a) in parsecs? (b) in km? (c) in light-years? The speed of light is $2.997\ 92 \times 10^{8}\ \mathrm{m\ s^{-1}}$, the radius of Earth's orbit is $1.495\ 98 \times 10^{8}$ km, and a tropical year is 365.24219mean solar days.

6.10.3

A meteor starts at $\alpha = 23^{\mathrm{h}}24^{\mathrm{m}}.0 \quad \delta = +04^{\circ}\ 00'$
and finishes at $\alpha = 01^{\mathrm{h}}36^{\mathrm{m}}.0 \quad \delta = +10^{\circ}\ 00'$

A second meteor, from the same shower (i.e. from the same meteoroid stream) starts at

$$\alpha = 00^{\mathrm{h}}06^{\mathrm{m}}.0 \quad \delta = +03^{\circ}\ 00'$$

and finishes at $\alpha = 02^{\mathrm{h}}12^{\mathrm{m}}.0 \quad \delta = +05^{\circ}\ 30'$.

Calculate the position of the radiant (i.e. the position on the sky where the two paths, projected backwards, intersect).

Again you'll notice that I chose the coordinates to be as awkward as I could.