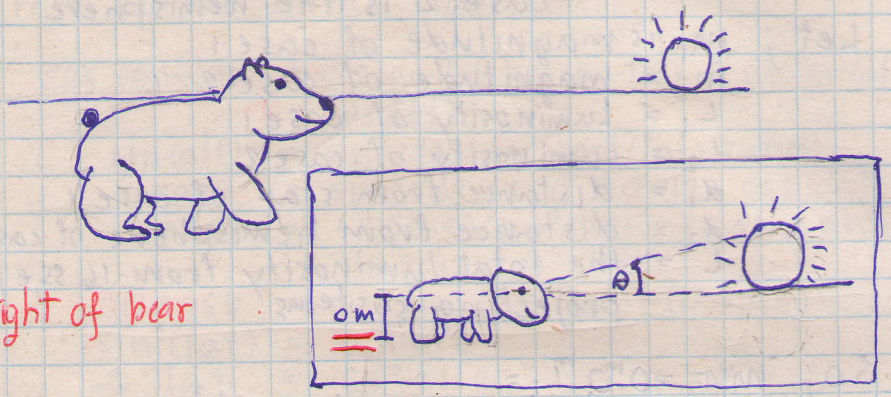
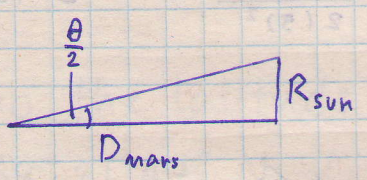
3. Sunrise on Mars

Let θ = angular size of sun at Mars.



Note to the height of bear



R_{sun} = the radius of Sun
$= 6.96 \times 10^5$ km

D_{Mar} = the distance from sun to Mars
$= 227.9 \times 10^6$ km

$$\tan\left(\frac{\theta}{2}\right) = \frac{R_{sun}}{D_{Mars}}$$

$$\tan\left(\frac{\theta}{2}\right) = \frac{6.96 \times 10^5}{227.9 \times 10^6}$$

$$\theta = 21'$$

Let EC = Ecliptic
CE = Celestial Equator
i = Axial tilt
NCP = North Celestial Pole