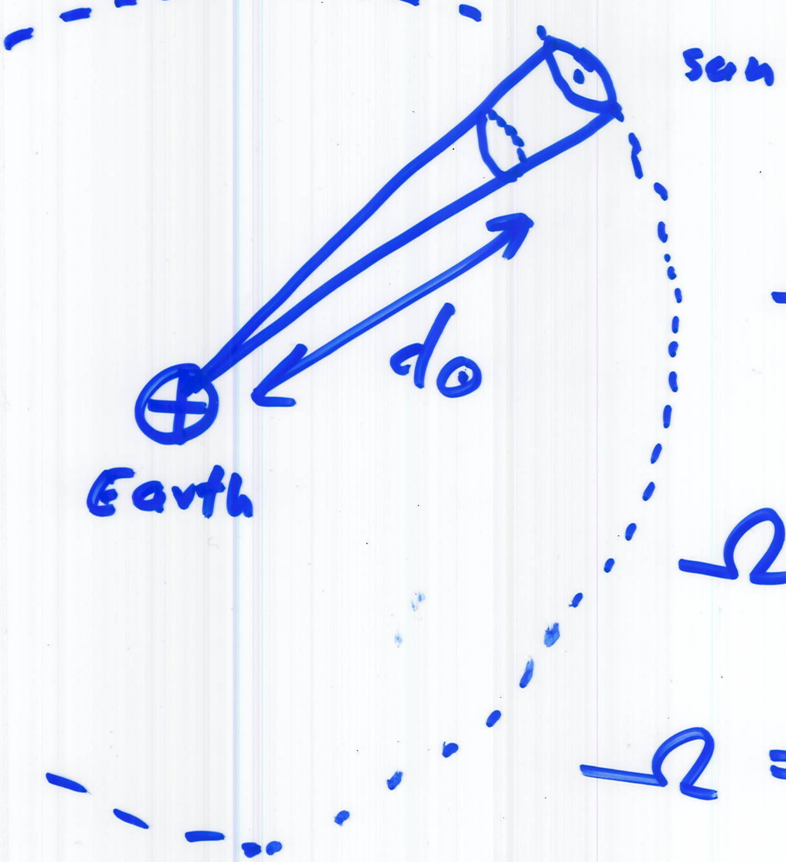
Ch 2 P1 a) b)



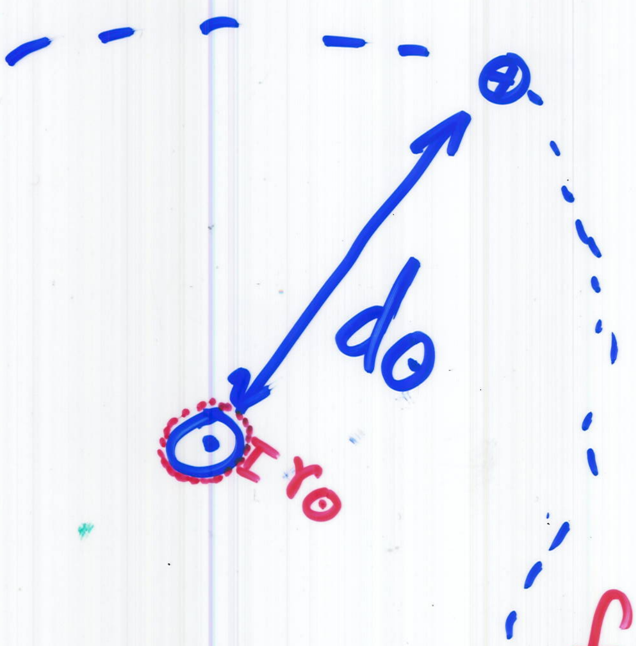
rad = $\frac{m}{m}$

steradian = $\frac{m^2}{m^2}$

$$\Omega = \frac{\text{area } \odot \text{ disk}}{\text{surface area of sphere}} \cdot 4\pi$$

$$\Omega = \frac{\pi r_\odot^2}{4\pi d_\odot^2} \cdot 4\pi$$

$$\Omega = \pi \frac{r_\odot^2}{d_\odot^2}$$



Total power radiated by the sun $L_\odot$

$$L_\odot = f(d_\odot)\, 4\pi d_\odot^2$$

$$= f(r_\odot)\, 4\pi r_\odot^2$$

$$f(r_\odot) = f(d_\odot)\left(\frac{d_\odot^2}{r_\odot^2}\right)$$

solar constant = $1.4 \frac{kW}{m^2}$

c) Stefan-Boltzmann Law

$$f(r_\odot) = \sigma T^4$$

$$f = \int_0^\infty \left(\frac{df}{d\nu}\right) d\nu = \int df = \int_0^\infty f_\nu \, d\nu$$

↑ bolometric flux

↑ differential flux

$$f = \int df = \int_0^\infty \left(\frac{df}{d\lambda}\right) d\lambda = \int_0^\infty f_\lambda \, d\lambda$$

Eq 2.5

$$f_\nu = \frac{2\pi h \nu^3}{c^2} \frac{1}{e^{\frac{h\nu}{kT}} - 1}$$

Jacobian

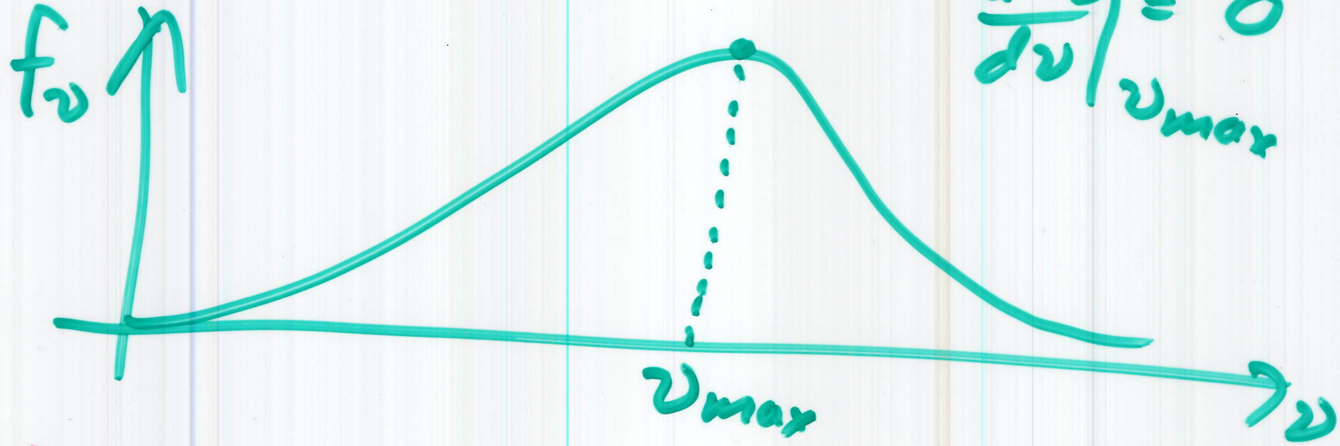
$$\nu = \frac{c}{\lambda}$$

$$f_\nu \, d\nu = f_\lambda \, d\lambda$$

$$f_\lambda = f_\nu \left|\frac{d\nu}{d\lambda}\right| = f_\nu \left|\frac{d}{d\lambda}\left(\frac{c}{\lambda}\right)\right| = +\frac{c}{\lambda^2} \cdot f_\nu$$

$$f_\lambda = \frac{2\pi h c^2}{\lambda^5} \frac{1}{e^{\frac{hc}{\lambda k T}} - 1}$$

$\hbar = \frac{h}{2\pi}$ reduced Planck



$$\left.\frac{df_\nu}{d\nu}\right|_{\nu_{max}} = 0$$

$$\left.\frac{df_\lambda}{d\lambda}\right|_{\lambda_{max}} = 0$$

Wien's Law $\nu_{max} = 2.8 \frac{k_B T}{h}$

$$\lambda_{max} = \frac{(0.29\,cm)K}{T}$$

$$\nu_{max} \neq \frac{c}{\lambda_{max}}$$