46 $p_0 = 10^5$ Pa

$\Gamma = 0$ $H = 10$ km $g = 10$ m/s²

$\left.\begin{array}{l}\theta = 0° \\ k_\lambda = 0.01\end{array}\right\}$ I guess

$\tau_\lambda = \frac{k_\lambda p}{g} = 1 \quad p = g/k_\lambda = 10^3$ Pa

$Z_1 = H \ln p_0/p = 10\text{ km} \ln 10^2 = 46$ km

47 (a) τ_λ 0.2 to 4.0

$$-e^{-\tau_\lambda}\Big|_{0.2}^{4} = e^{-0.2} - e^{-4} = 0.8$$

(b) same

(c) $p = \tau_\lambda g/k_\lambda = 200$ Pa to 4×10^3 Pa

$\Delta z = H \ln p_1/p_2 = H \ln 4/0.2 = 3H$

48 too easy I'm skipping

49 $T_\lambda \equiv e^{-\tau_\lambda \sec\theta}$ $\tau_\lambda = \frac{-\ln T_\lambda}{\sec\theta}$ I guess it means for $\theta = 0°$ so $\tau_\lambda = -\ln T_\lambda$

52 $\tau_\lambda \to 0$ Eq 4.45 = intensity trans at $60° = \theta$

$$T_\nu^f = 2\int_0^1 e^{-\tau_\nu/\mu}\,\mu\,d\mu$$

$$\approx 2\int_0^1 \left(1 - \frac{\tau_\nu}{\mu}\right)\mu\,d\mu$$

$$\approx 2\left(\mu^2/2 - \tau_\nu\mu\right)\Big|_0^1 = 1 - 2\tau_\nu$$

$T_\nu(\theta = 60°) = e^{-\tau_\nu \sec\theta}$
$= e^{-\tau_\nu 2}$
$\approx 1 - 2\tau_\nu$