Atmospheric Physics (10.0 points)

Part A. Surface Temperature of the Earth (1.2 points)

A.1 (0.2 pt)

$P_0 =$

A.2 (0.3 pt)

$T_{g0} =$

A.3 (0.7 pt)

$T_g =$

Part B. The absorption spectrum of atmospheric gases (1.8 points)

B.1 (0.5 pt)

$\omega_d =$

B.2 (0.2 pt)

$E_p =$

B.3 (0.2 pt)

$f - f_o =$

B.4 (0.2 pt)

$C =$

B.5 (0.3 pt)

$p_2(f) \propto$

B.6 (0.4 pt)

$f^\star - f_0 =$

Sketch of $p(f)$ as a function of $f - f_o$:

Part C. Stability of air in the atmosphere (2.7 points)

C.1 (0.3 pt)

$\frac{dp}{dz} =$

C.2 (0.2 pt)

$\frac{dp}{dz} =$

C.3 (0.2 pt)

$p(z) =$

C.4 (0.6 pt)

$\Gamma_a =$

C.5 (1.4 pt)

Equation of motion for δz:

Conditions for stable equilibrium:

$\omega =$

Part D. Moisture (2.7 points)

D.1 (0.5 pt)

$\frac{dp_s}{dT} =$

D.2 (0.2 pt)

$p_s(T) =$

D.3 (2.0 pt)

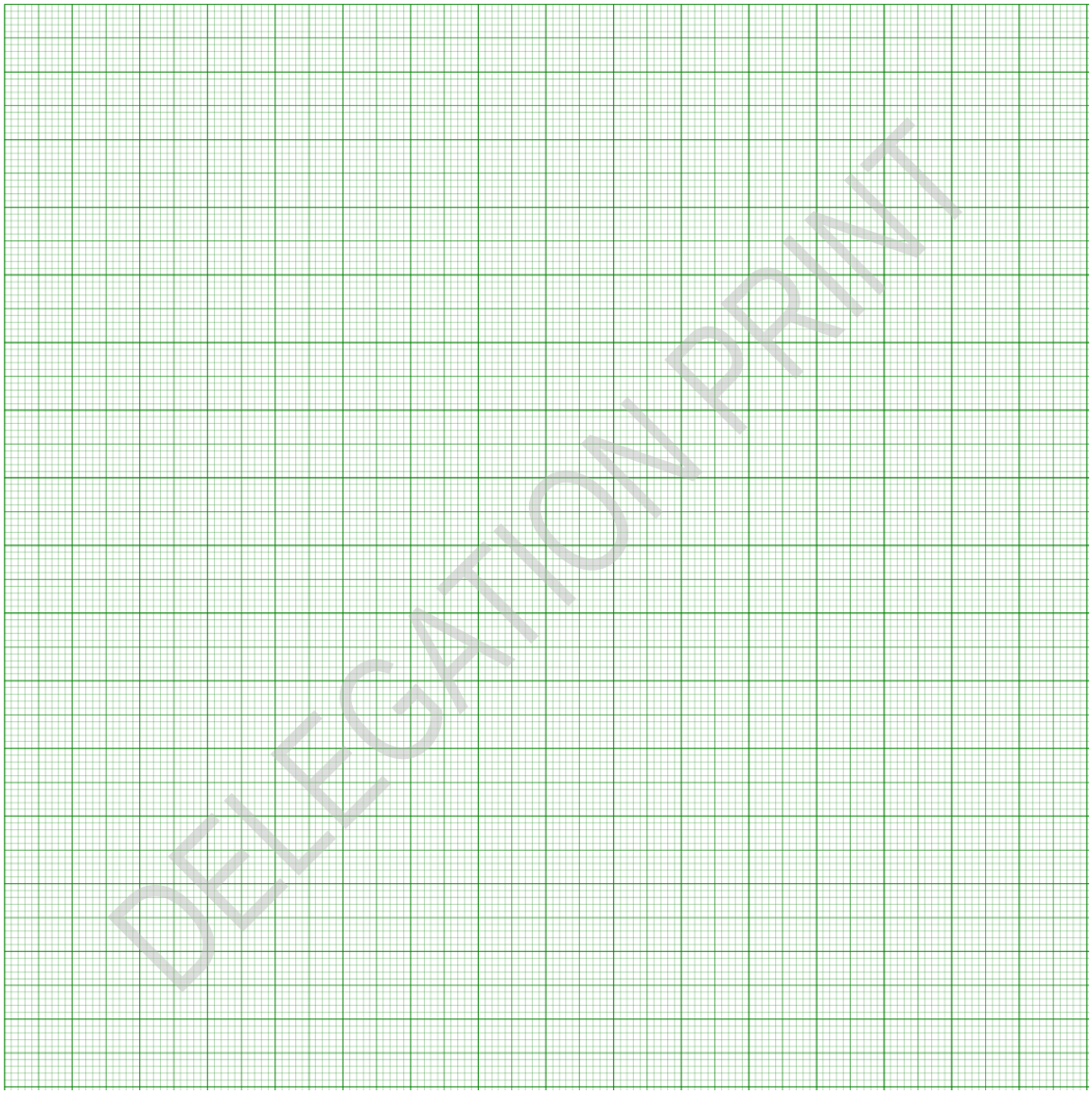
$T_l =$

Part E. Sun halo (1.6 points)

E.1 (0.8 pt)

$\delta =$

E.2 (0.6 pt)
Plot δ as a function of α:



E.3 (0.2 pt)

Angle at which the halo appears with respect to the sun =