Pression atmosphérique

restart

Gaz parfait isotherme

$\varrho(z) := \frac{p(z)\cdot M}{R\cdot T}$

$$z \to \frac{p(z)\,M}{R\,T} \tag{1.1}$$

$eq1 := \frac{\mathrm{d}}{\mathrm{d}z} p(z) = -\varrho(z)\cdot g$

$$\frac{\mathrm{d}}{\mathrm{d}z} p(z) = -\frac{p(z)\,M g}{R\,T} \tag{1.2}$$

$ci := p(0) = p0$

$$p(0) = p0 \tag{1.3}$$

$ppi := rhs(dsolve(\{eq1, ci\}))$

$$p0\,\mathrm{e}^{-\frac{M g z}{R T}} \tag{1.4}$$

$p0 := 1; M := 29; g := 9.8; R := 8.31; T := 280;$

$$1$$
$$29$$
$$9.8$$
$$8.31$$
$$280 \tag{1.5}$$

$pii := plot(ppi, z = 0..20, y = 0..1, color = red)$

$$PLOT(\ldots) \tag{1.6}$$

Gaz parfait avec gradient thermique

$T(z) := T0\cdot\left(1 - \frac{z}{H}\right)$

$$z \to T0\left(1 - \frac{z}{H}\right) \tag{2.1}$$

$\varrho(z) := \frac{p(z)\cdot M}{R\cdot T(z)}$

$$z \to \frac{p(z)\,M}{R\,T(z)} \tag{2.2}$$

$eq1 := \frac{\mathrm{d}}{\mathrm{d}z} p(z) = -\varrho(z)\cdot g$

$$\frac{\mathrm{d}}{\mathrm{d}z} p(z) = -\frac{p(z)\,M g}{R\,T0\left(1 - \frac{z}{H}\right)} \tag{2.3}$$

$ci := p(0) = p0$

$$p(0) = p0 \tag{2.4}$$

$ppg := rhs(dsolve(\{eq1, ci\}))$

$$\frac{p0\,(H - z)^{\frac{MHg}{RT0}}}{H^{\frac{MHg}{RT0}}} \tag{2.5}$$

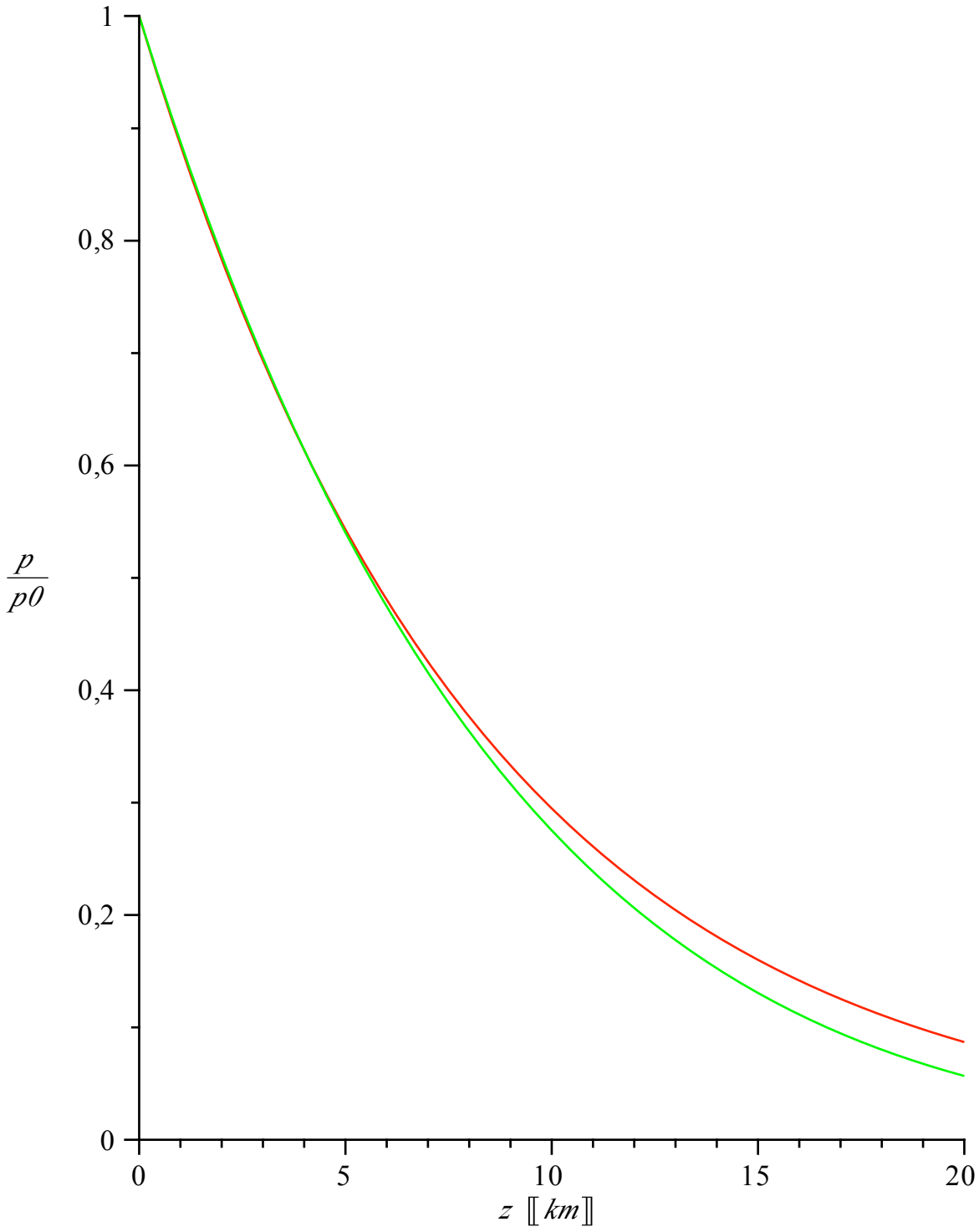
$p0 := 1; M := 29; g := 9.8; R := 8.31; T0 := 290; H := 60;$

$$1$$
$$29$$
$$9.8$$
$$8.31$$
$$290$$
$$60 \tag{2.6}$$

$pgg := plot(ppg, z = 0..20, y = 0..1, color = green)$

$$PLOT(\ldots) \tag{2.7}$$

$plots[display](pii, pgg)$


1
0,8
0,6
0,4
0,2
0
p
p0
0
5
10
15
20
z [[km]]