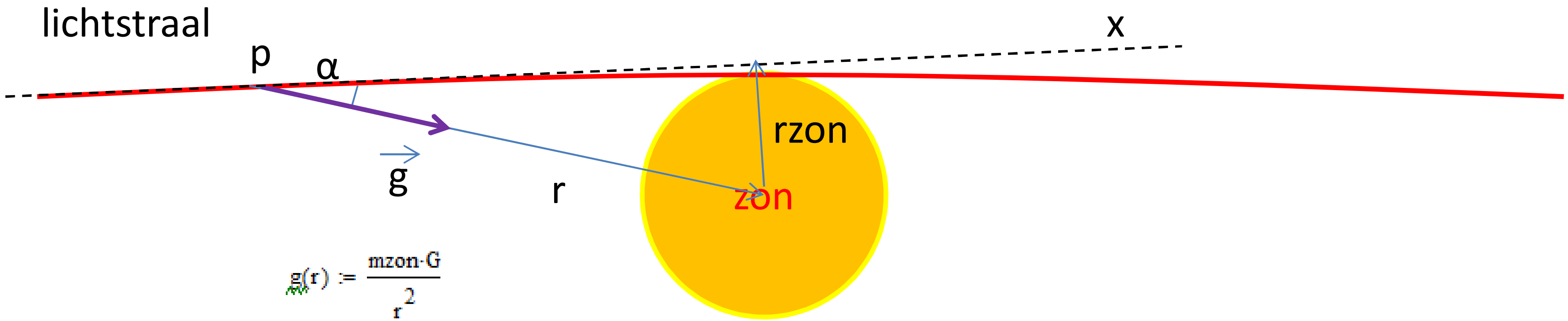
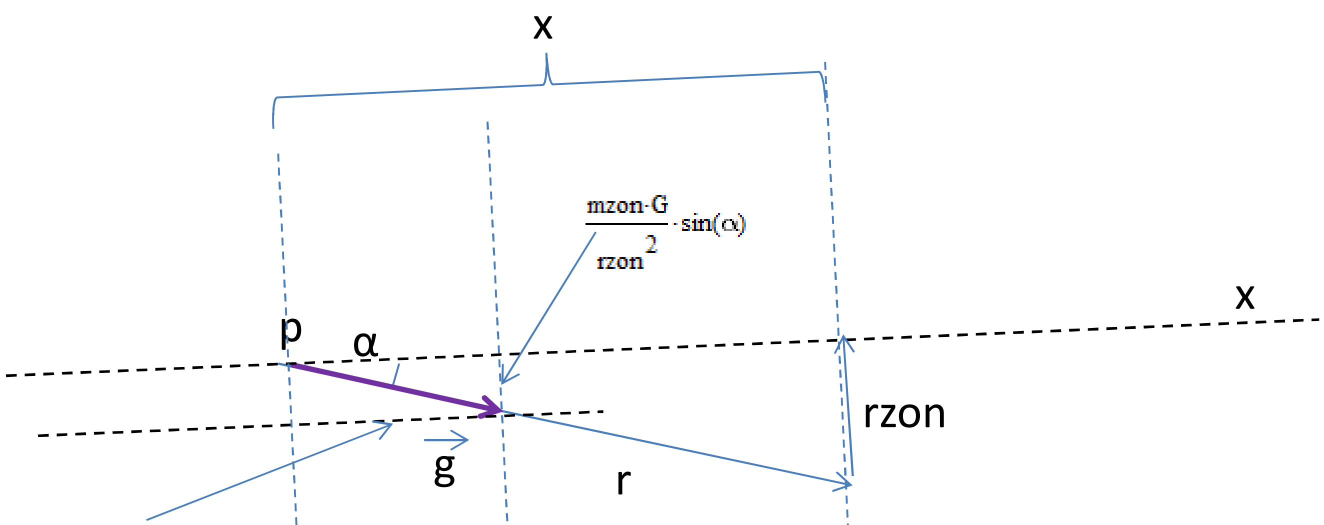


$$g(r) := \frac{mzon \cdot G}{r^2}$$



$$\frac{mzon \cdot G}{rzon^2} \cdot \cos(\alpha)$$

$$\sin\alpha(x, rzon) := \sqrt{\frac{rzon^2}{x^2 + rzon^2}}$$

$$\cos\alpha(x, rzon) := \sqrt{\frac{x^2}{x^2 + rzon^2}}$$

Fill in

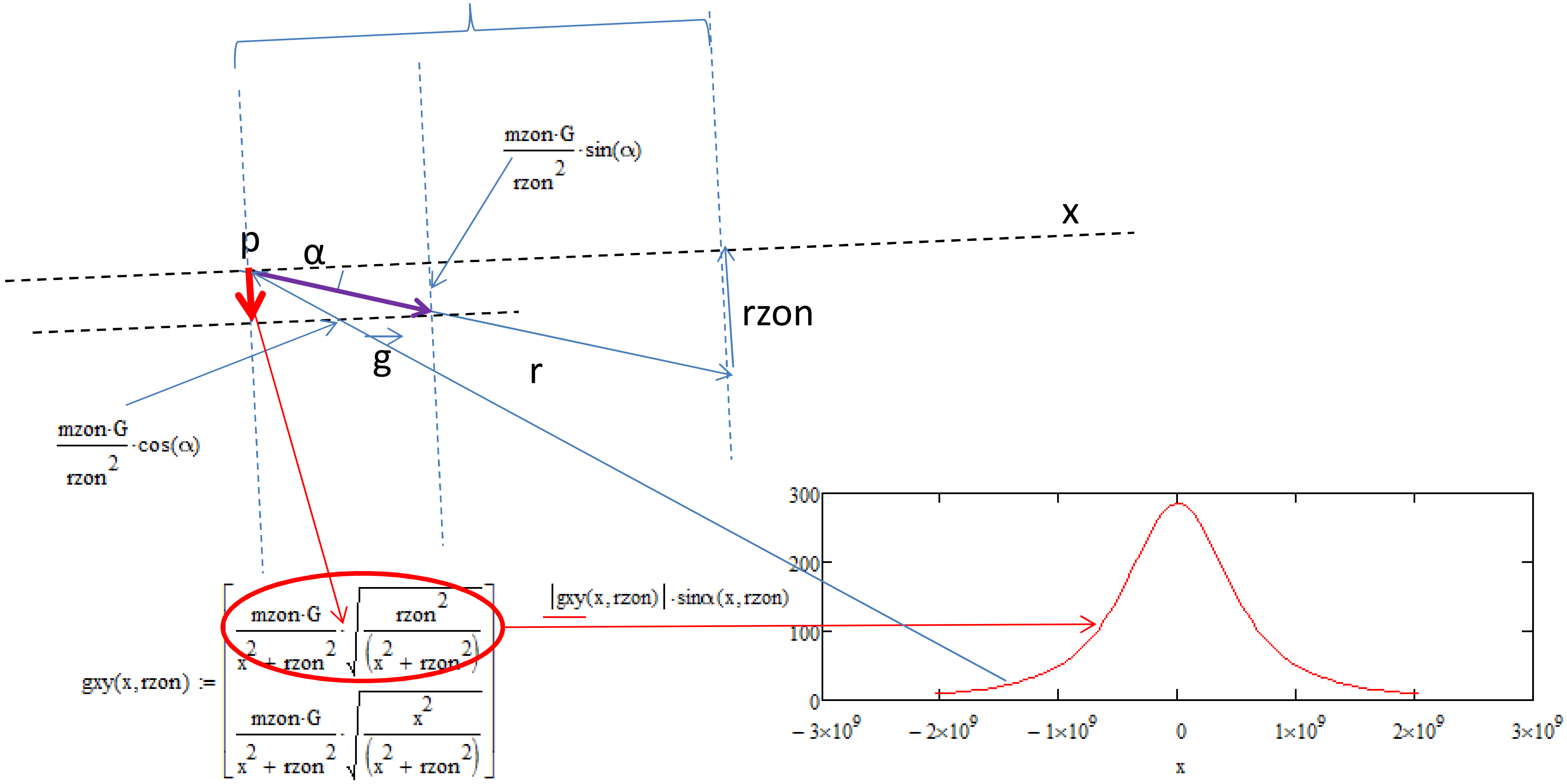
Fill in

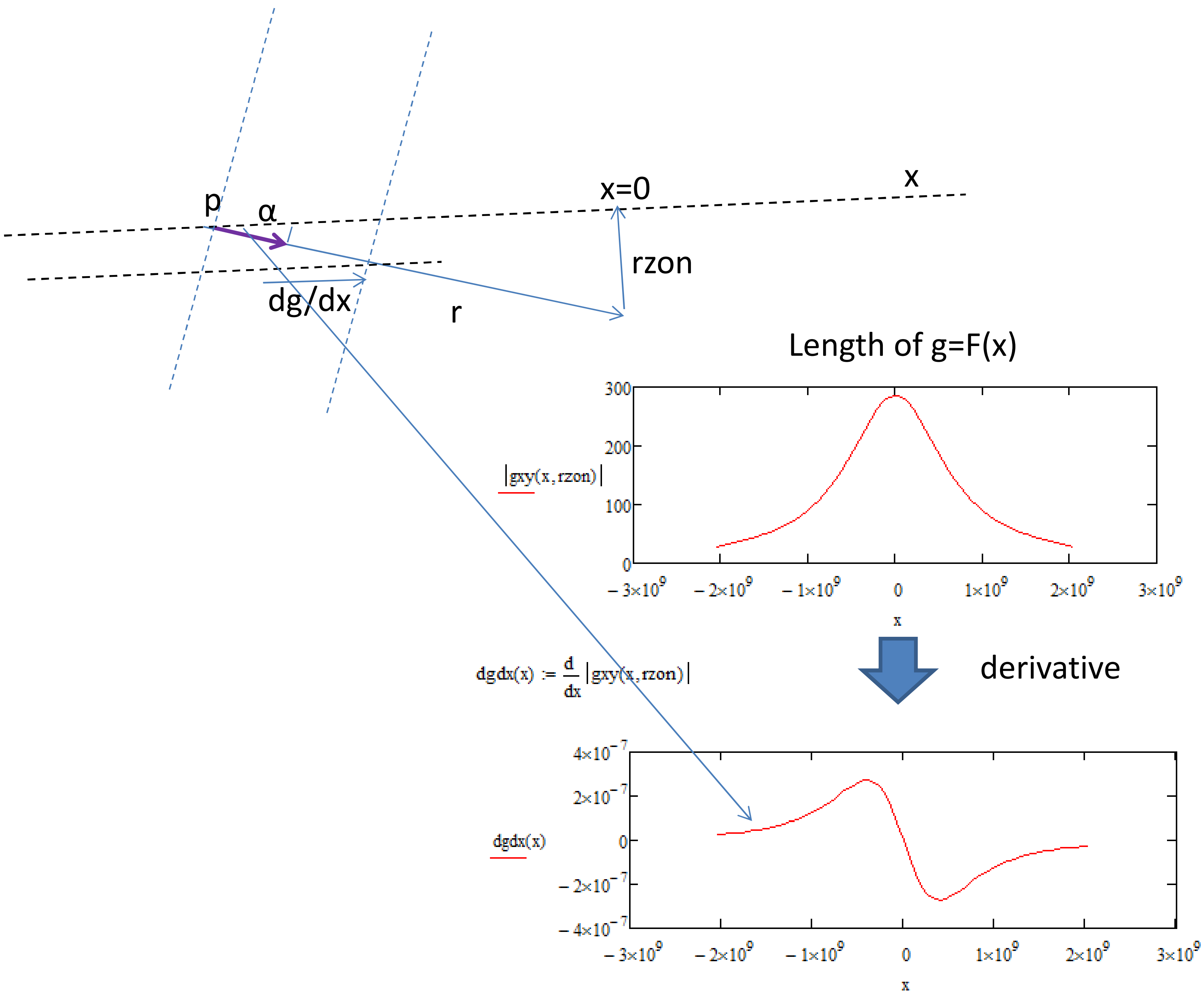
$$g\_alpha\_r(\alpha, rzon) := \begin{pmatrix} \frac{mzon \cdot G}{rzon^2} \cdot \sin(\alpha) \\ \frac{mzon \cdot G}{rzon^2} \cdot \cos(\alpha) \end{pmatrix}$$

gives

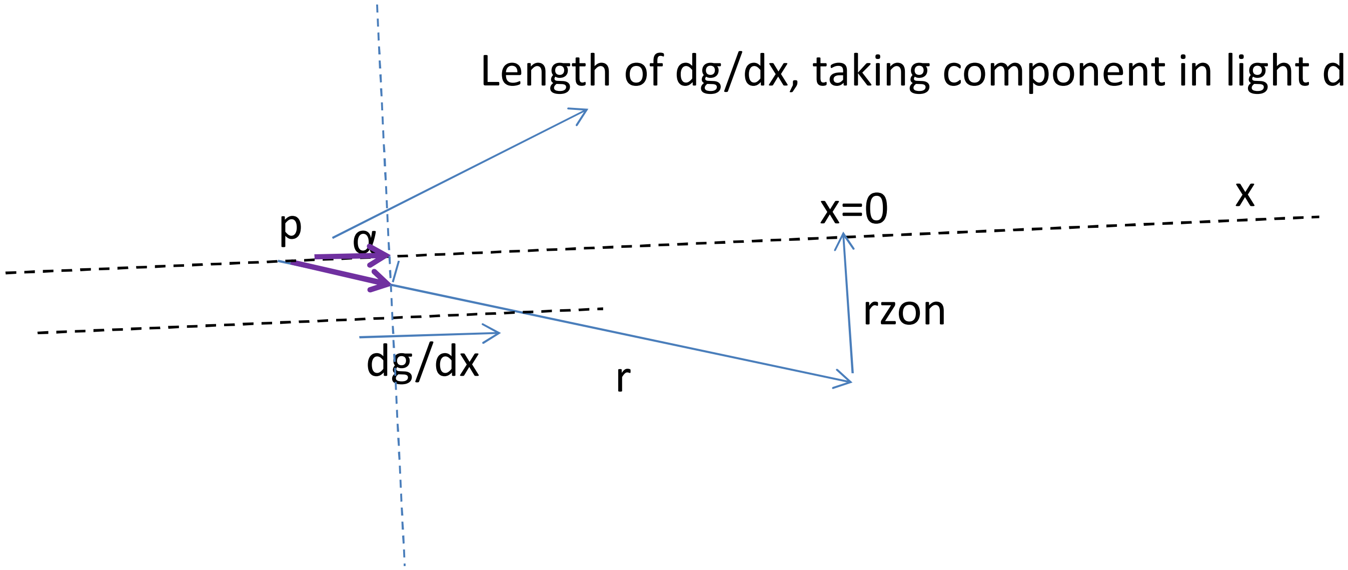
$$gxy(x, rzon) := \begin{bmatrix} \frac{mzon \cdot G}{x^2 + rzon^2} \cdot \sqrt{\frac{rzon^2}{\left(x^2 + rzon^2\right)}} \\ \frac{mzon \cdot G}{x^2 + rzon^2} \cdot \sqrt{\frac{x^2}{\left(x^2 + rzon^2\right)}} \end{bmatrix}$$

Red vector is vertical part of g

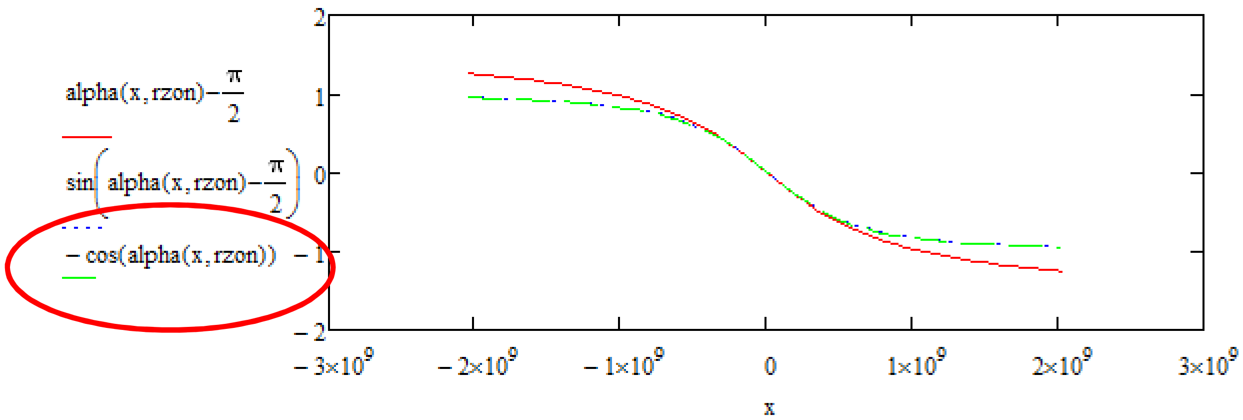



p
α
x=0
x
rzon
dg/dx
r
Length of g=F(x)
|gxy(x, rzon)|
300
200
100
0
– 3×10^9
– 2×10^9
– 1×10^9
0
1×10^9
2×10^9
3×10^9
x
derivative
dgdx(x) := d/dx |gxy(x, rzon)|
dgdx(x)
4×10^-7
2×10^-7
0
– 2×10^-7
– 4×10^-7
– 3×10^9
– 2×10^9
– 1×10^9
0
1×10^9
2×10^9
3×10^9
x

Length of dg/dx, taking component in light direction by cos(α)

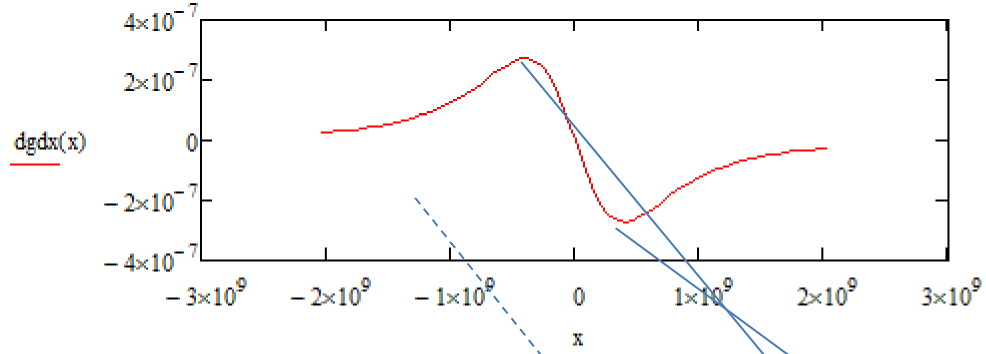


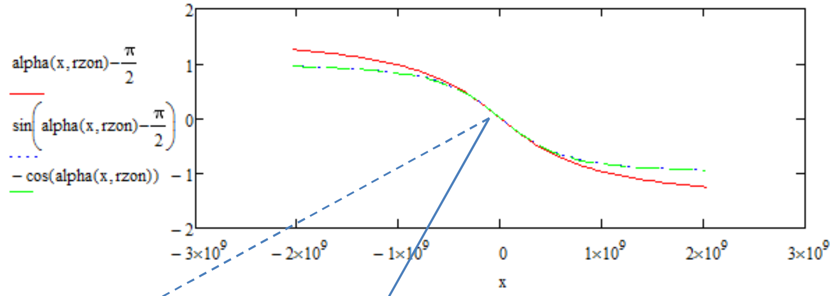
α, sin(α-pi/2) and -cos(α) as function of x



Fina result of the additional bending term

$$dgdx(x) := \frac{d}{dx}\left|gxy(x,rzon)\right|$$

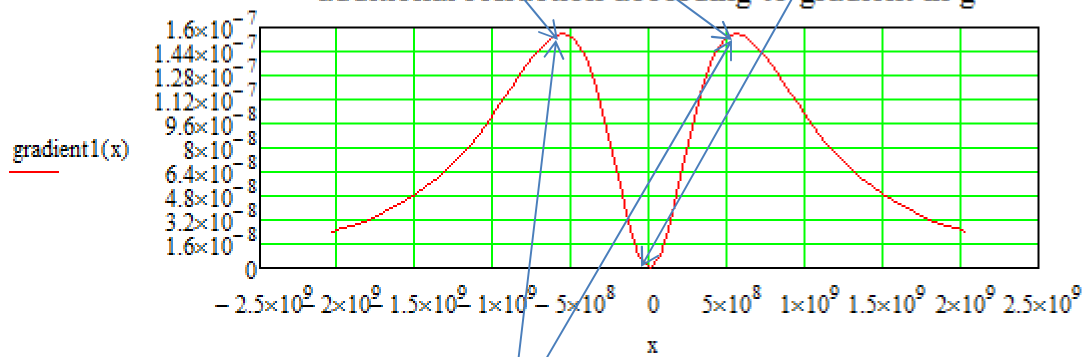




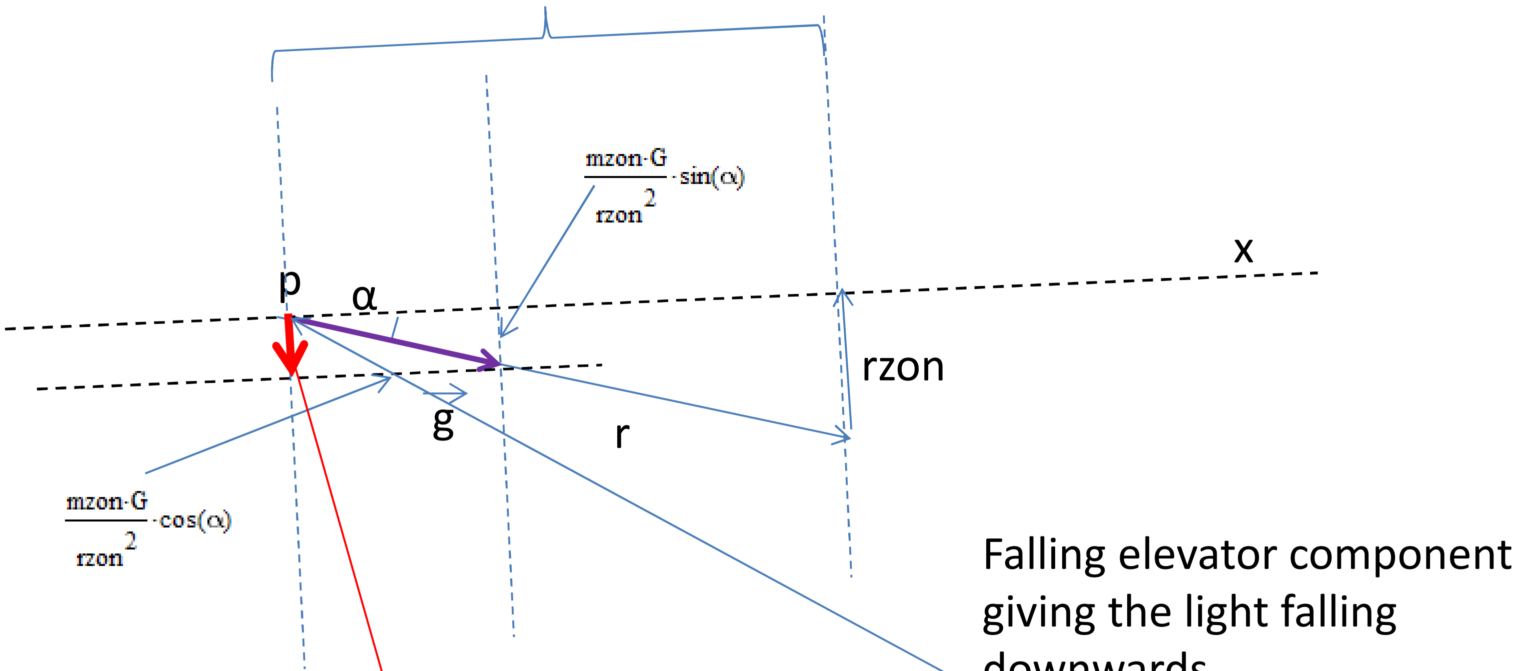
Zero due to zero in cos

$$gradient1(x) := dgdx(x)\cdot -\cos(alpha(x,rzon))$$

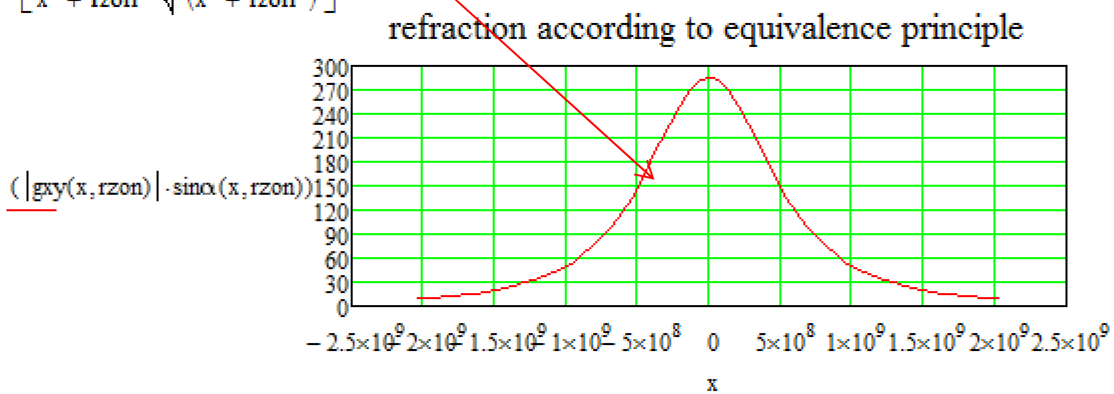
additional refraction according to gradient in g



2 peaks due to maxima in dg/dx

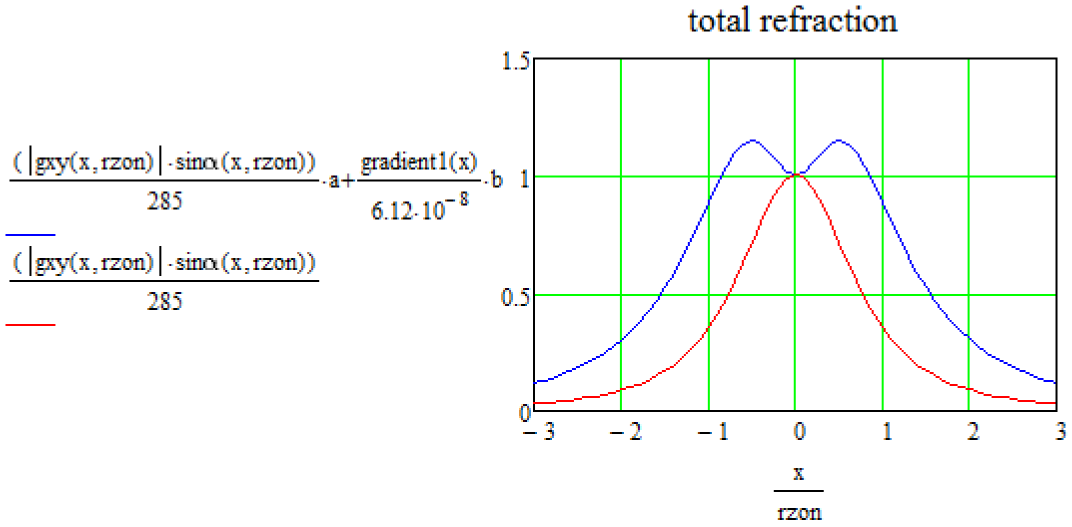


$$gxy(x, rzon) := \begin{bmatrix} \dfrac{mzon \cdot G}{x^2 + rzon^2} \cdot \sqrt{\dfrac{rzon^2}{\left(x^2 + rzon^2\right)}} \\ \dfrac{mzon \cdot G}{x^2 + rzon^2} \cdot \sqrt{\dfrac{x^2}{\left(x^2 + rzon^2\right)}} \end{bmatrix}$$



Adding up both terms

$a := 1$ $b := 0.22$



total refraction