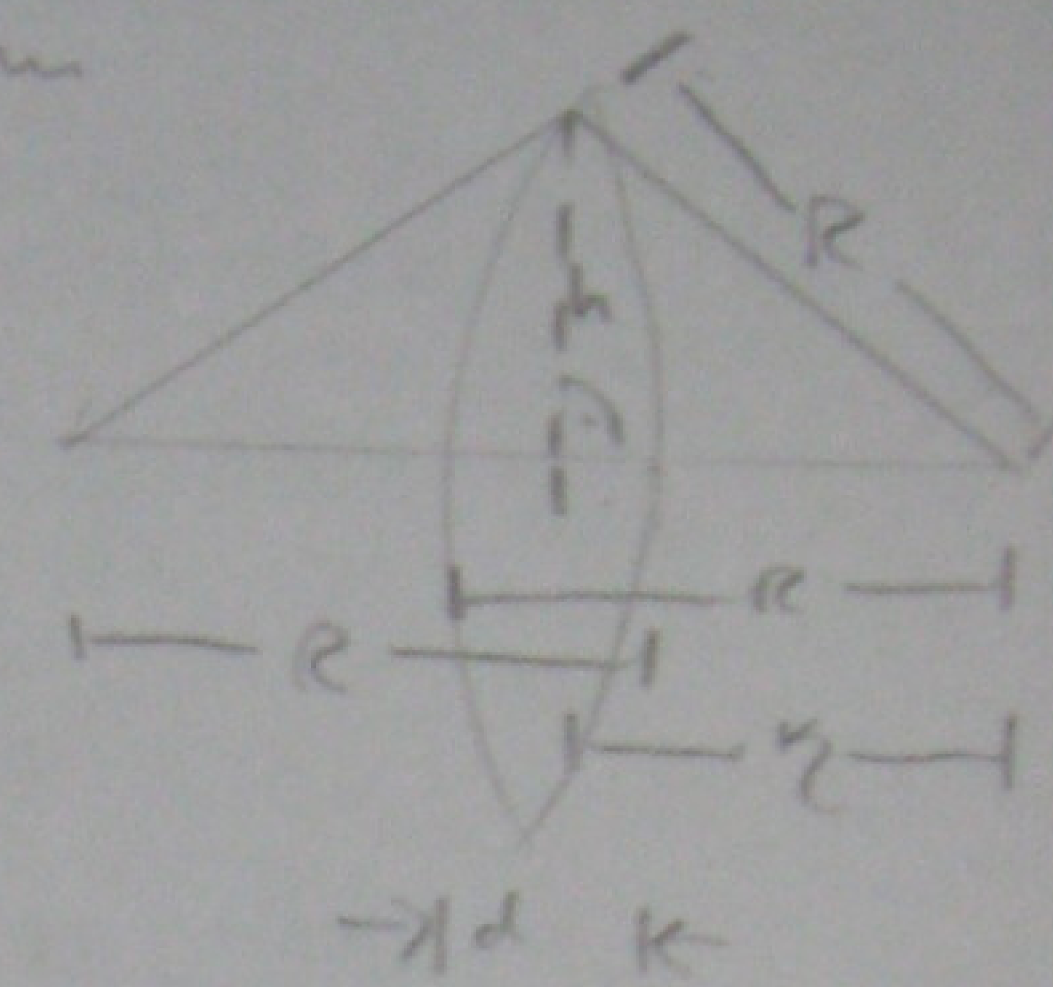
1

(a) $\frac{1}{g}+\frac{1}{b} = (n-1)\cdot\left(\frac{1}{R_1}+\frac{1}{R_2}\right)$

$\frac{1}{g}+\frac{1}{b}=\frac{1}{f}=D$ $\quad g\to\infty$: $\quad \frac{1}{b}=\frac{1}{f}=D$; $\quad R_1 = R_2 =: R$

$$D=(n-1)\frac{2}{R} \Rightarrow R=(n-1)\frac{2}{D}$$

$D = 2\,dpt = \frac{2}{m}$, $n=1{,}4 \Rightarrow R = 0{,}4\cdot 1\,m = 40\,cm$



(b) $r_2=\sqrt{R^2-h^2}$

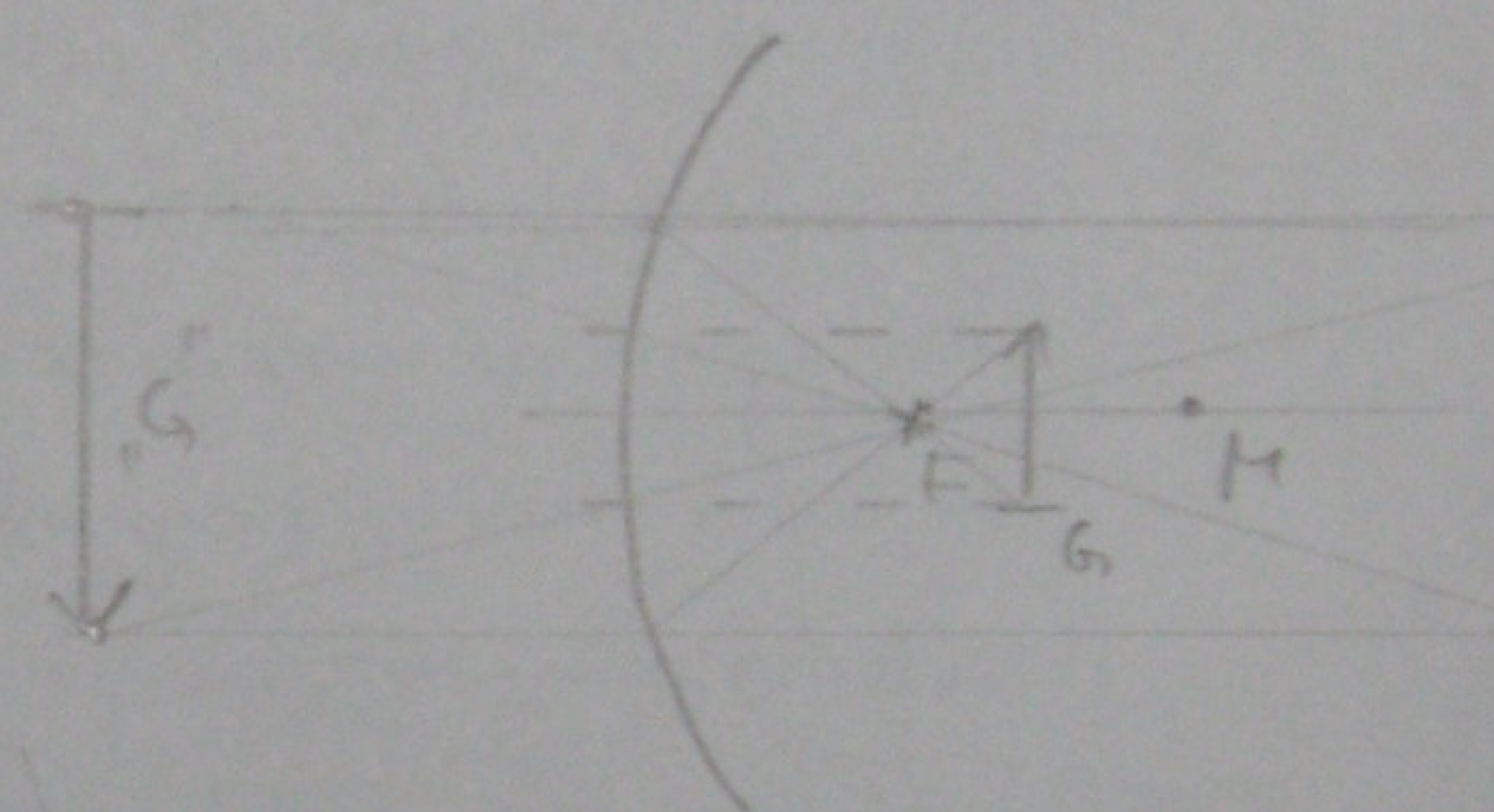
$d = 2(R-r_2) = 2(R-\sqrt{R^2-h^2})$

$= 2R\left(1-\sqrt{1-h^2/R^2}\right)$

$\approx 0{,}627$ cm.

2

(b) „G" ist größer und auf dem Kopf.



3 $y=x^2$; betr. Tangente:

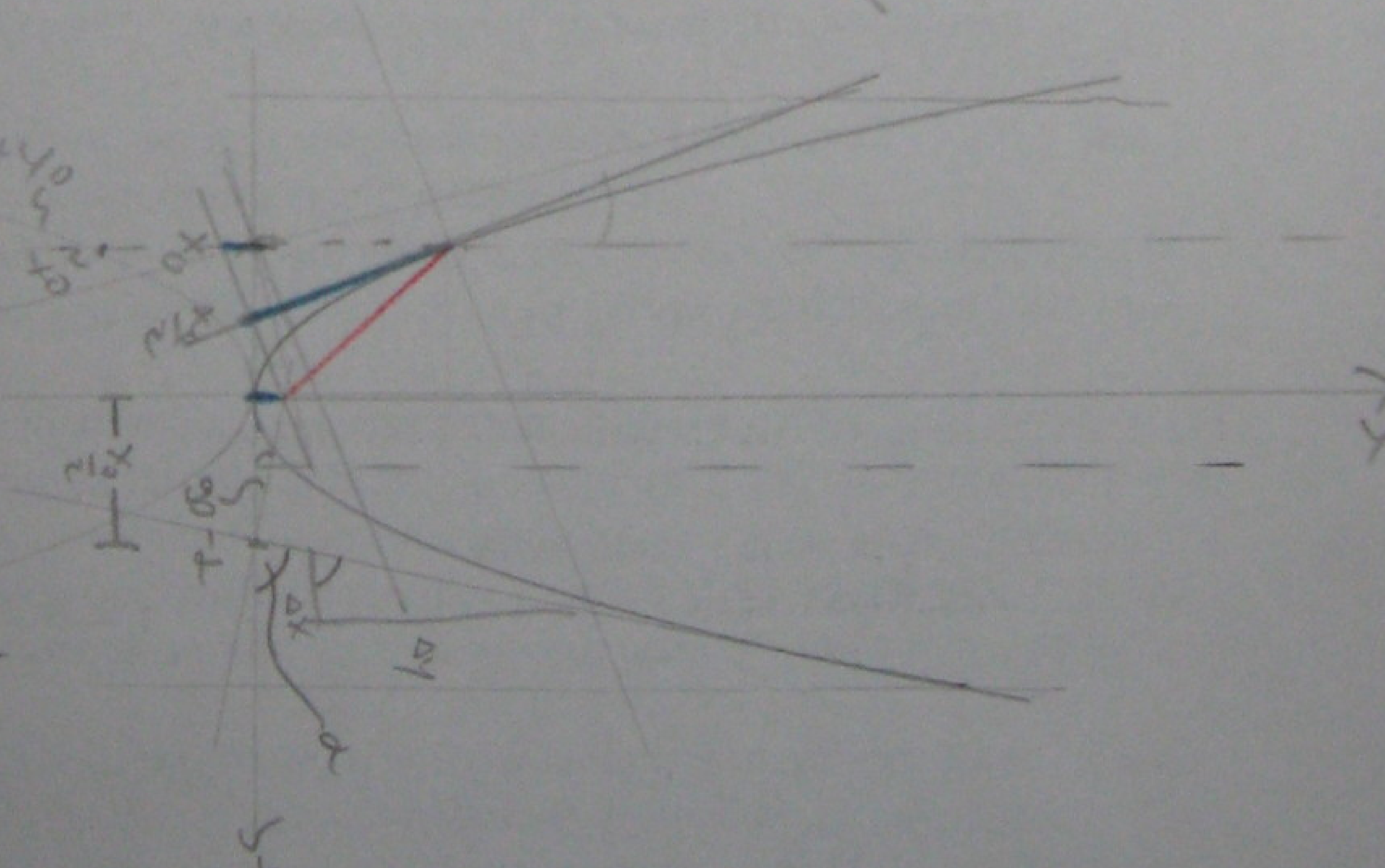
$t_{x_0}: x \mapsto 2x_0(x-x_0)+y_0$

Schnittp. mit x-Achse:

$0 = 2x_0(x-x_0)+x_0^2$

$\Rightarrow x=\frac{1}{2}x_0$.

Konstr. an SP. Senkrechte zur Tangente; diese schneiden y-Achse stets im selben Pkt.:



$m=\frac{\Delta y}{\Delta x}=2x_0=\tan\alpha$

$h=\underbrace{\tan(90-\alpha)}_{\frac{1}{2x_0}}\cdot\frac{x_0}{2} = \frac{1}{4}$

$\theta^1 = 90 - \alpha$

$\theta^2 = \arcsin\left(\frac{\sin\theta^1}{n}\right)$

$\tau = \theta^1 - \theta^2$

$[\sigma = 135 - \alpha - \tau]$

$\delta = 180 - 45 - \alpha - \tau$

$\theta^3 = 90 - \delta = -45 + \alpha + \tau$

$\theta^4 = \arcsin(n \cdot \sin\theta^3)$

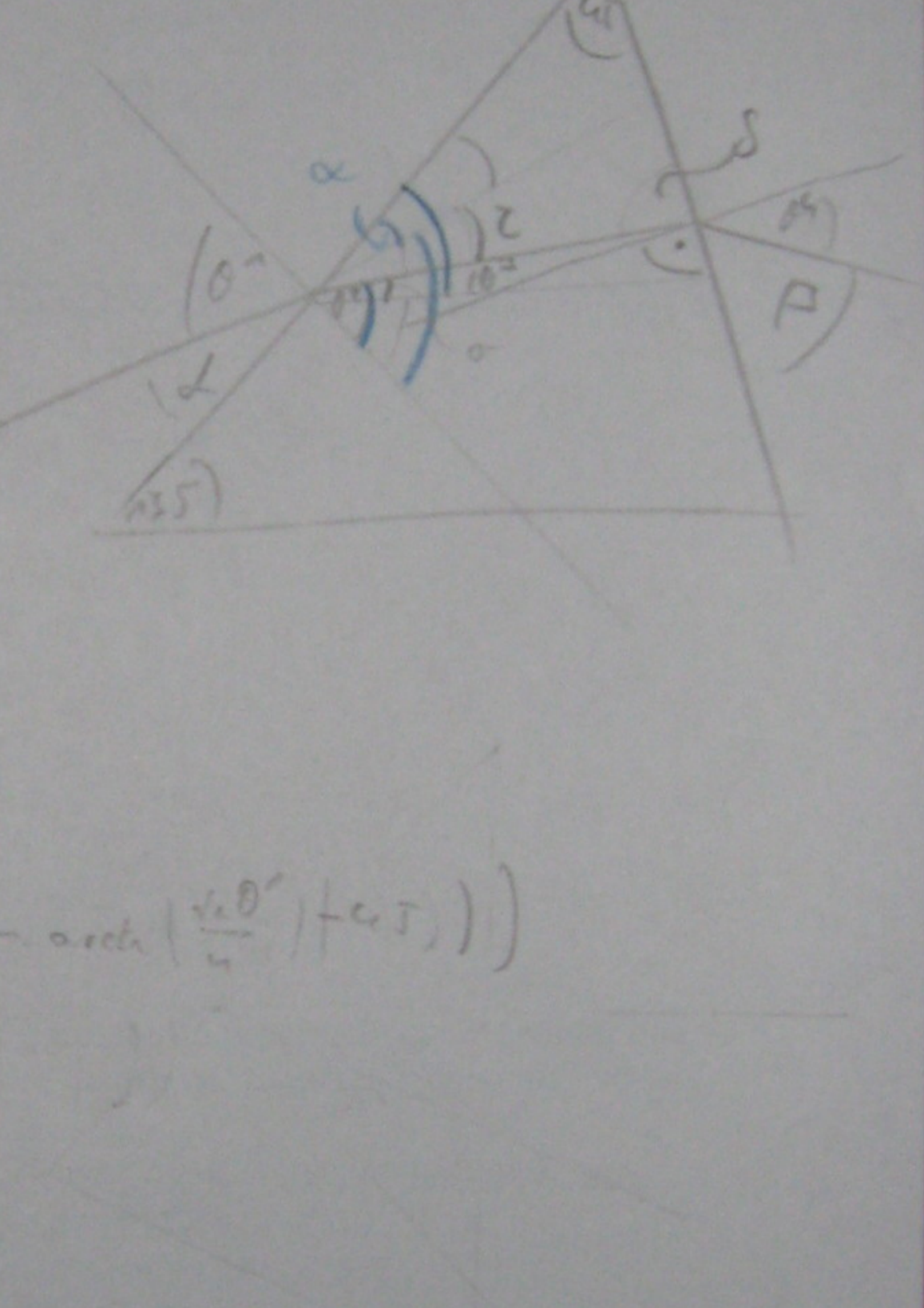
$\beta = 90 - \theta^4$

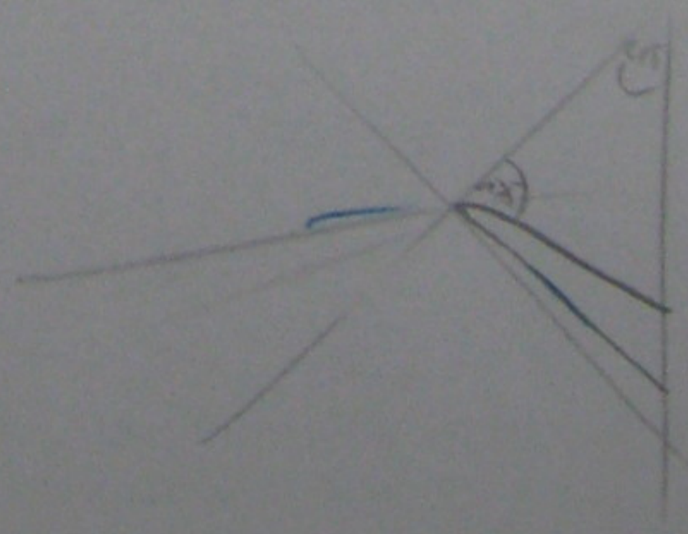
$\beta = 90 - \arcsin\left(n \cdot \sin\left(\alpha + 90 - \alpha - \arctan\left(\frac{\sqrt{2}\theta^1}{n}\right) + 45\right)\right)$

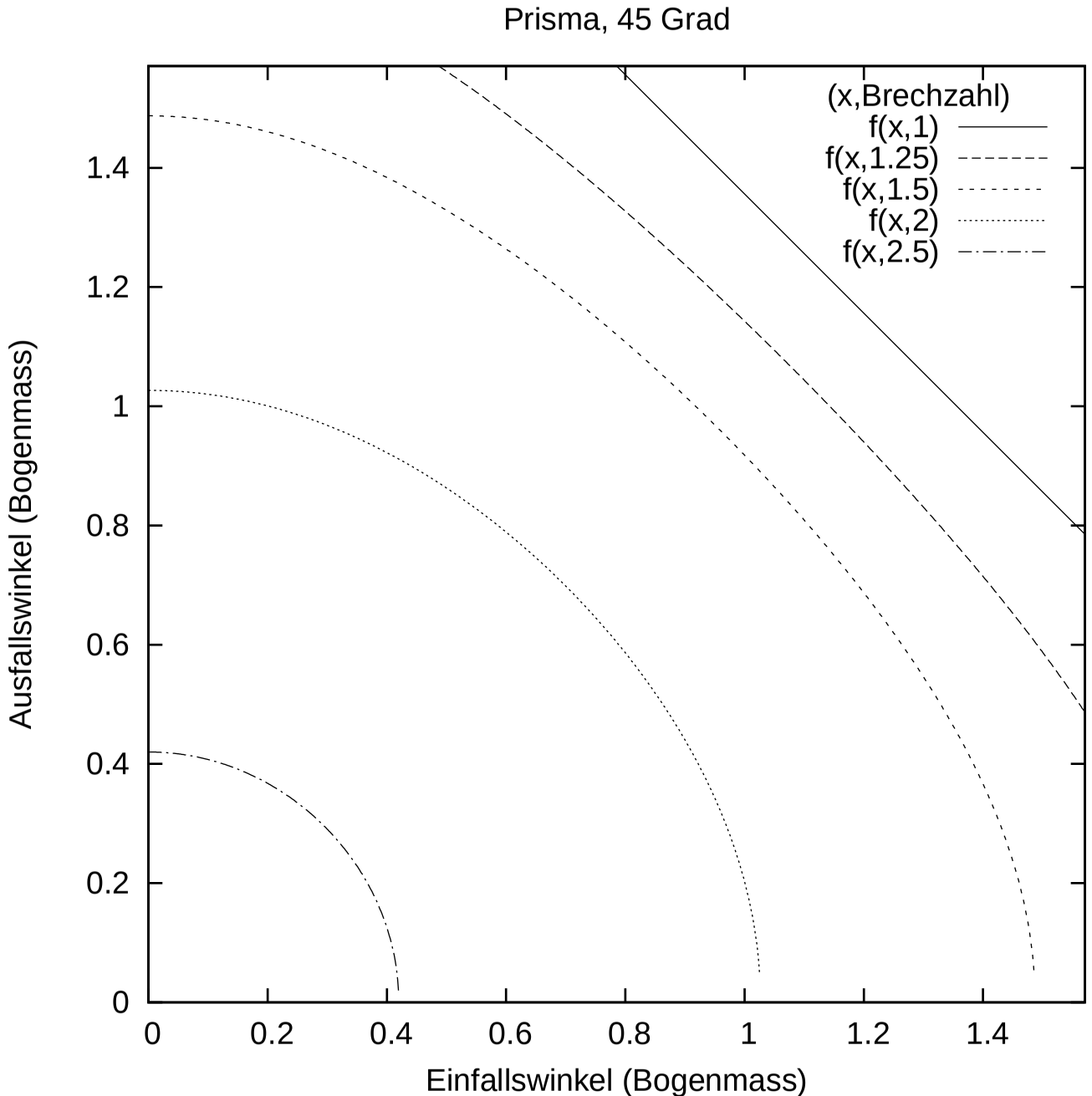
$\alpha = 60$

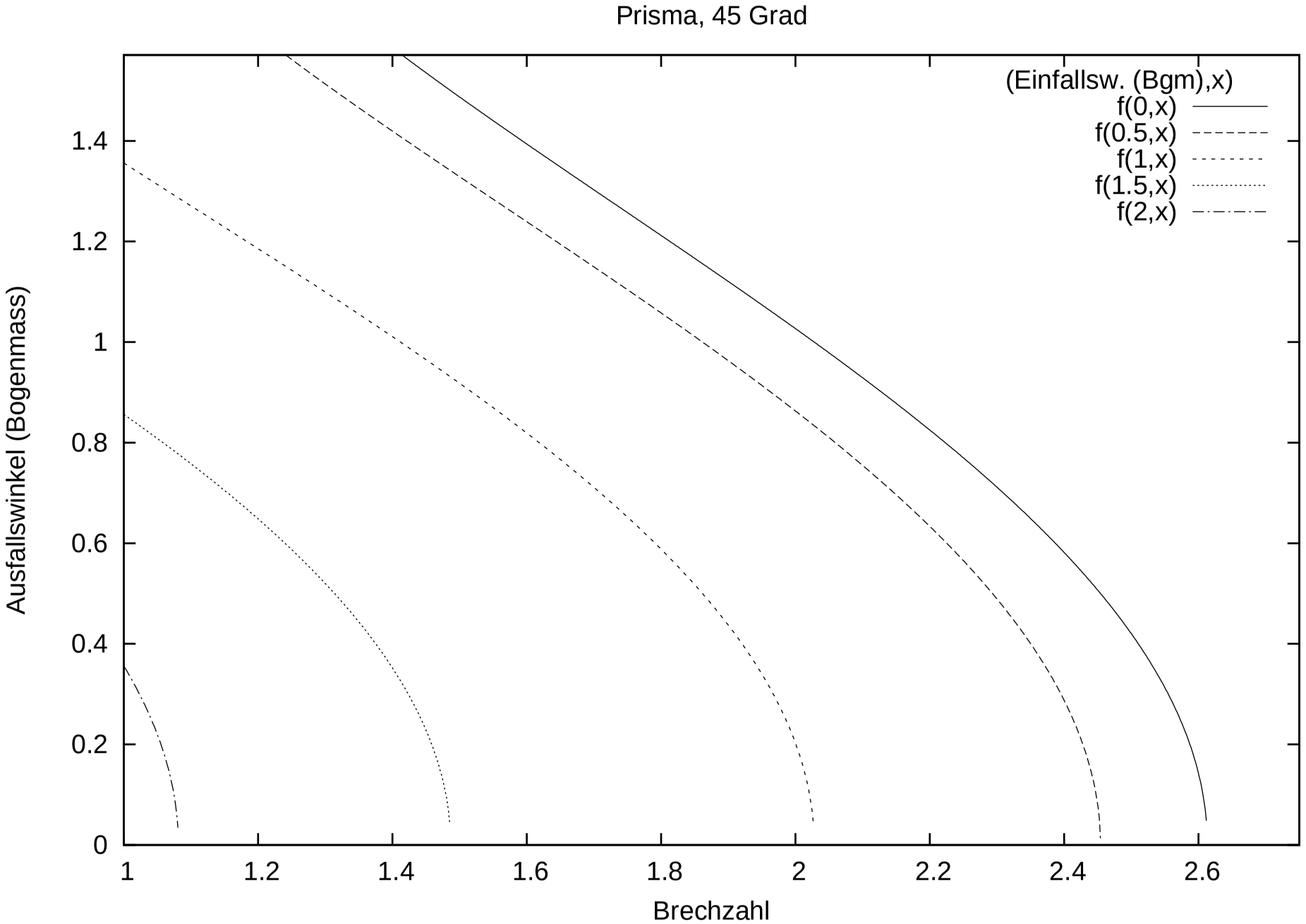
$n = 2: \quad 60,12$

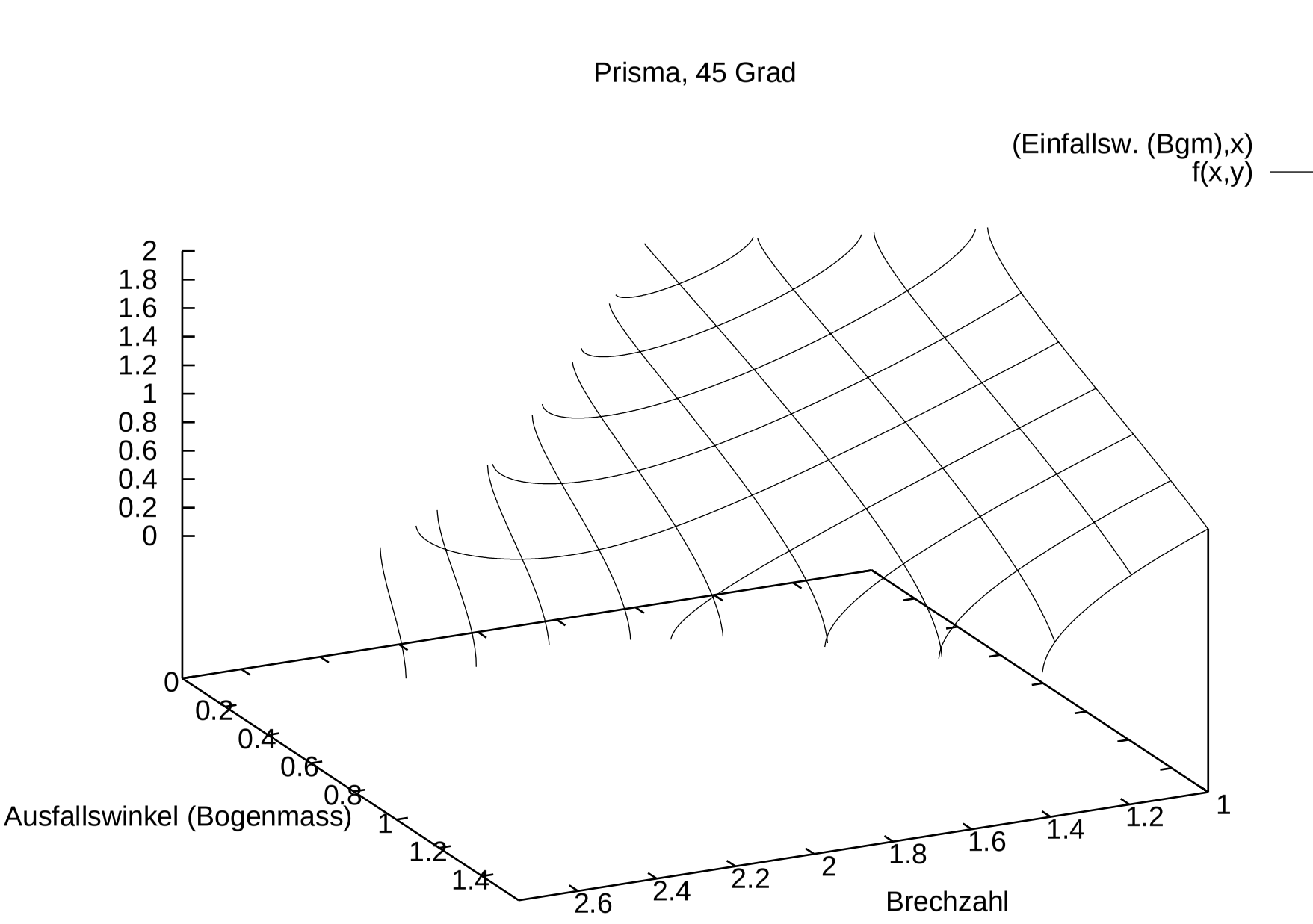
$n = 1.6: \quad 53,15$

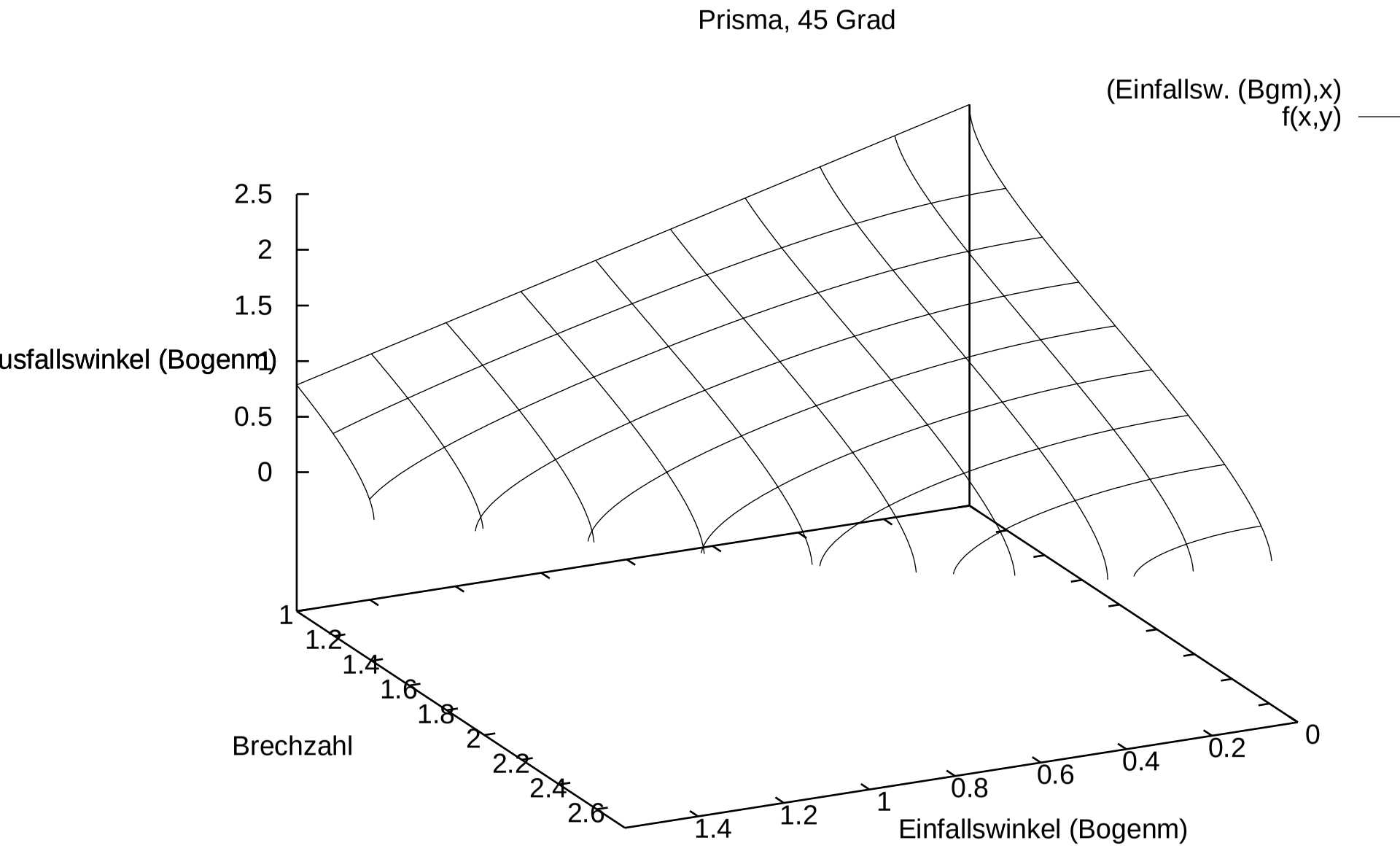





Prisma, 45 Grad
(x,Brechzahl)
f(x,1)
f(x,1.25)
f(x,1.5)
f(x,2)
f(x,2.5)
Ausfallswinkel (Bogenmass)
Einfallswinkel (Bogenmass)
0
0.2
0.4
0.6
0.8
1
1.2
1.4


Prisma, 45 Grad
(Einfallsw. (Bgm),x)
f(0,x)
f(0.5,x)
f(1,x)
f(1.5,x)
f(2,x)
Ausfallswinkel (Bogenmass)
Brechzahl
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1
1.2
1.4
1.6
1.8
2
2.2
2.4
2.6


Prisma, 45 Grad
(Einfallsw. (Bgm),x)
f(x,y)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Ausfallswinkel (Bogenmass)
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
Brechzahl


Prisma, 45 Grad
(Einfallsw. (Bgm),x)
f(x,y)
2.5
2
1.5
1
0.5
0
usfallswinkel (Bogenm)
1
1.2
1.4
1.6
1.8
2
2.2
2.4
2.6
Brechzahl
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Einfallswinkel (Bogenm)