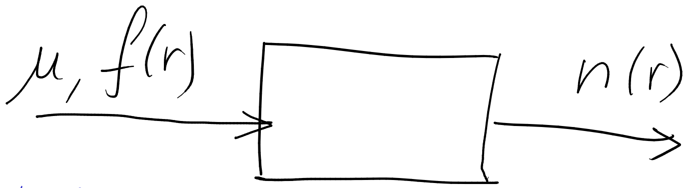
$$n(r) = \frac{2L_0}{r\left[\left(\frac{r}{f(r)}\right)^{\mu/2} + \left(\frac{f(r)}{r}\right)^{\mu/2}\right]}$$



Příklad

MFE(2) $\quad \Delta\varphi = \pi = \frac{\pi}{\mu} \Rightarrow \underline{\mu = 1}$

$r_- = \frac{1}{r_+} \qquad r_+ = \frac{1}{r_-}$

$\underline{f(r) = \frac{1}{r}}$

$n(r=1) = 1$

$$n(r) = \frac{2L_0}{r\left[\left(\frac{r}{1/r}\right)^{1/2} + \left(\frac{1/r}{r}\right)^{1/2}\right]} = \frac{2L_0}{1+r^2} = \frac{2}{1+r^2}$$

Příklad: Eatonův profil

$\mu = 1 \qquad \left(\Delta\varphi = \frac{\pi}{\mu} = \pi\right)$

$r_- + r_+ = 2$

$f(r) = 2 - r$

$$n(r) = \frac{2}{r\left[\left(\frac{r}{2-r}\right)^{1/2} + \left(\frac{2-r}{r}\right)^{1/2}\right]} = \frac{2}{r\,\frac{r+2-r}{\sqrt{r(2-r)}}}$$

$$= \frac{\sqrt{r(2-r)}}{r} = \underline{\underline{\sqrt{\frac{2}{r} - 1}}}$$

Příklad: Luneburg

$\mu = 2 \qquad \Delta\varphi = \frac{\pi}{\mu} = \frac{\pi}{2}$

$a^2 + b^2 = 2$

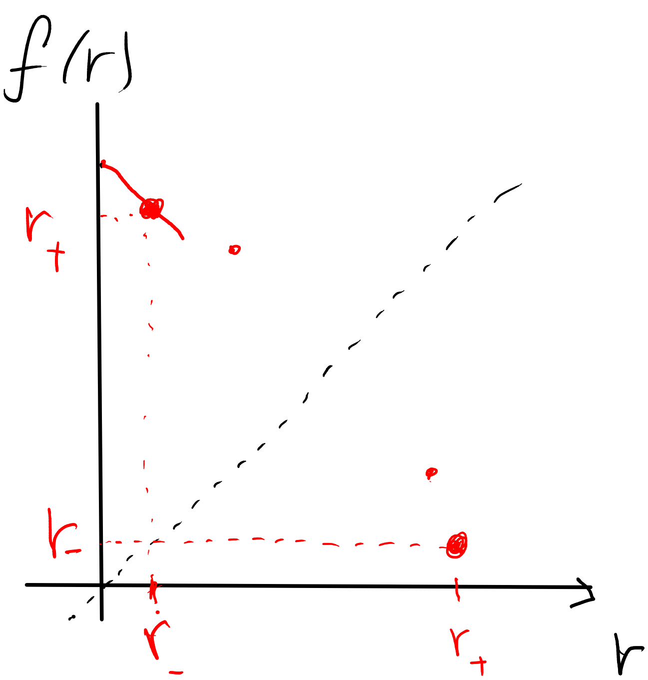
$a \downarrow r_+ \qquad b \uparrow r_-$

$$r_+^2 + r_-^2 = 2$$

$$f(r) = \sqrt{2 - r^2}$$

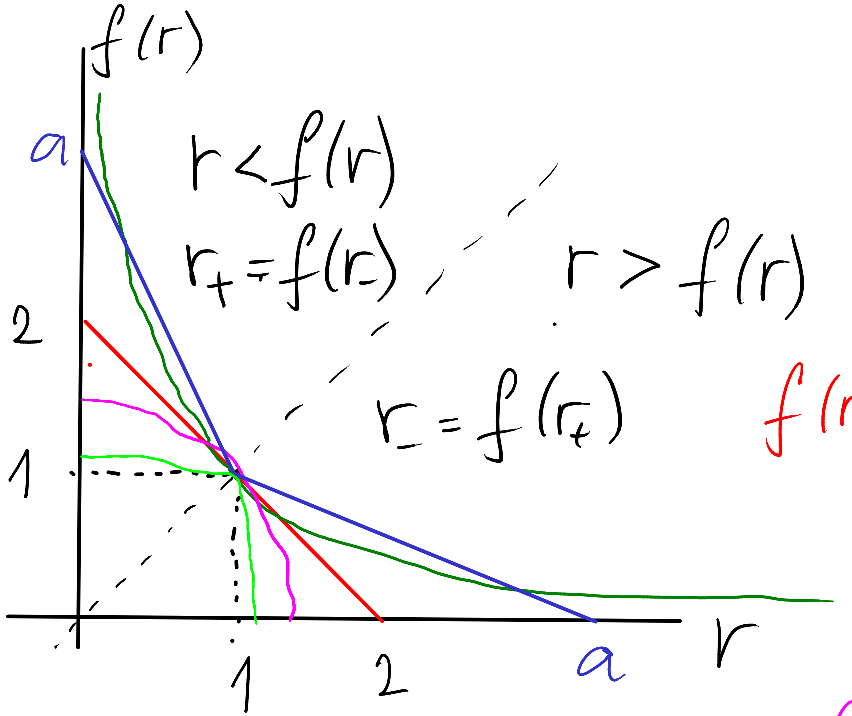
$$n(r) = \frac{2}{r\left[\frac{r}{\sqrt{2-r^2}} + \frac{\sqrt{2-r^2}}{r}\right]} = \frac{2}{r\,\frac{r^2 + 2 - r^2}{r\sqrt{(2-r^2)}}}$$

$$= \sqrt{2 - r^2}$$



$f(r_+) = r_-$

$f(r_-) = r_+$



$r_- \leq r_+$

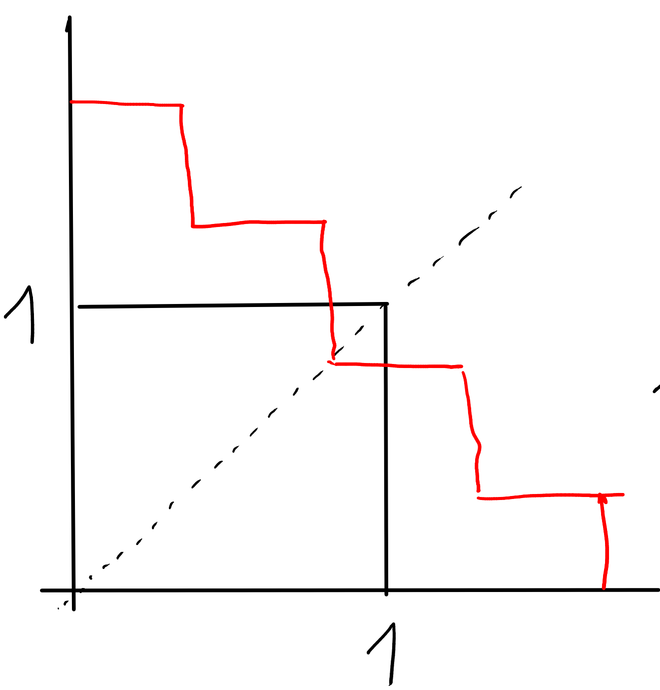
$f(r) = 2 - r$

$f(r) = \frac{1}{r}$

$f(r) = \sqrt{2 - r^2}$

$$\frac{2\pi}{5} = \Delta\varphi = \frac{\pi}{\mu} \Rightarrow \mu = \frac{5}{2}$$

$$\Delta\varphi = \frac{3}{2}\pi = \frac{\pi}{\mu} \qquad \mu = \frac{2}{3}$$



$f(r) = 1$

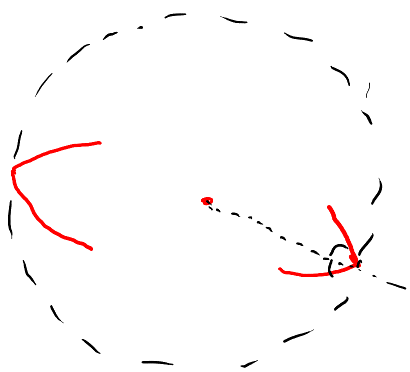
$\mu = 2 \quad , \quad \Delta\varphi = \frac{\pi}{\mu} = \frac{\pi}{2}$

$$n(r) = \frac{2}{r\left[\left(\frac{r}{1}\right)^1 + \left(\frac{1}{r}\right)^1\right]} = \underline{\frac{2}{1+r^2}}$$

$f(r) = 1$

$\cancel{f(r_+) = r_-}$

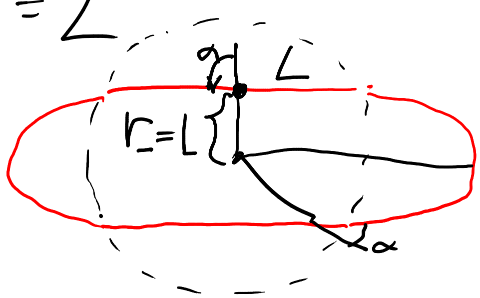
$f(r_-) = r_+$ $\qquad$ $r_+ = f(r_-) = 1$



MINÃNO

$n = 2$

$n(r) = 1$ pro $r \le 1$



$L = n r \sin\alpha$

v ~~bodě~~ vzdálu r_-

je $L = r_-$

$$\frac{2}{L} = \frac{r_+}{r_-} + \frac{r_-}{r_+} = \frac{r_+}{L} + \frac{L}{r_+}$$

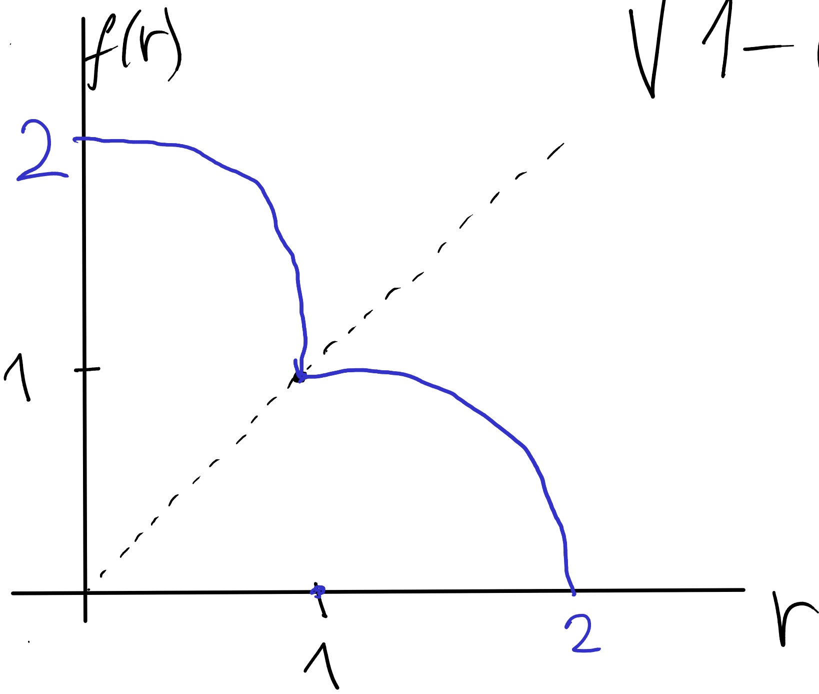
$$r_+^2 - 2r_+ + L^2 = 0$$

$$r_+ = f(r_-) = 1 + \sqrt{1 - L^2} = 1 + \sqrt{1 - r_-^2}$$

$$1 - r_-^2 = (r_+ - 1)^2$$

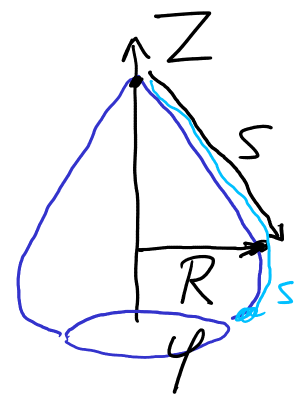
$$r_- = \sqrt{1 - (r_+ - 1)^2}$$

$$f(r) = \begin{cases} 1 + \sqrt{1 - r^2}, & r \leq 1 \\ \sqrt{1 - (r-1)^2} & r \geq 1 \end{cases}$$



Geodetické čáry

rovina (r,φ) $\longleftrightarrow$



$$n^2 dl^2 = n^2(dr^2 + r^2 d\varphi^2) =$$

$$= ds^2 + R^2 d\varphi^2$$

$$= dR^2 + dZ^2 + R^2 d\varphi^2$$

$$\boxed{R = nr} \qquad (\rho = nr)$$

$$ds^2 = n^2 dr^2$$

$$ds^2 = dR^2 + dZ^2 = (n\,dr + r\,dn)^2 + dZ^2$$

$$= \cancel{n^2 dr^2} + 2nr\,dr\,dn + r^2 dn^2 + dZ^2$$

$$= \cancel{n^2 dr^2}$$

$$dZ^2 = -2nr\,dr\,dn - r^2 dn^2$$

$$n' = \frac{dn}{dr} \Rightarrow dn = n'\,dr$$

$$dZ^2 = (-2nn'r - r^2 n'^2)\,dr^2$$

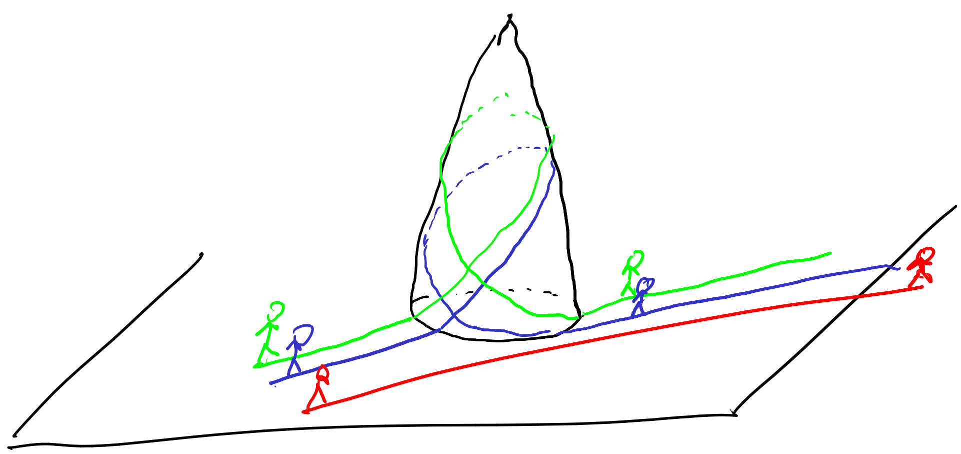
$$\frac{dz}{dr} = \pm\sqrt{-2rnn' - r^2 n'^2}$$

$(R(r), z(r))$

Příklad: MFE, $n = \dfrac{2}{1+r^2}$

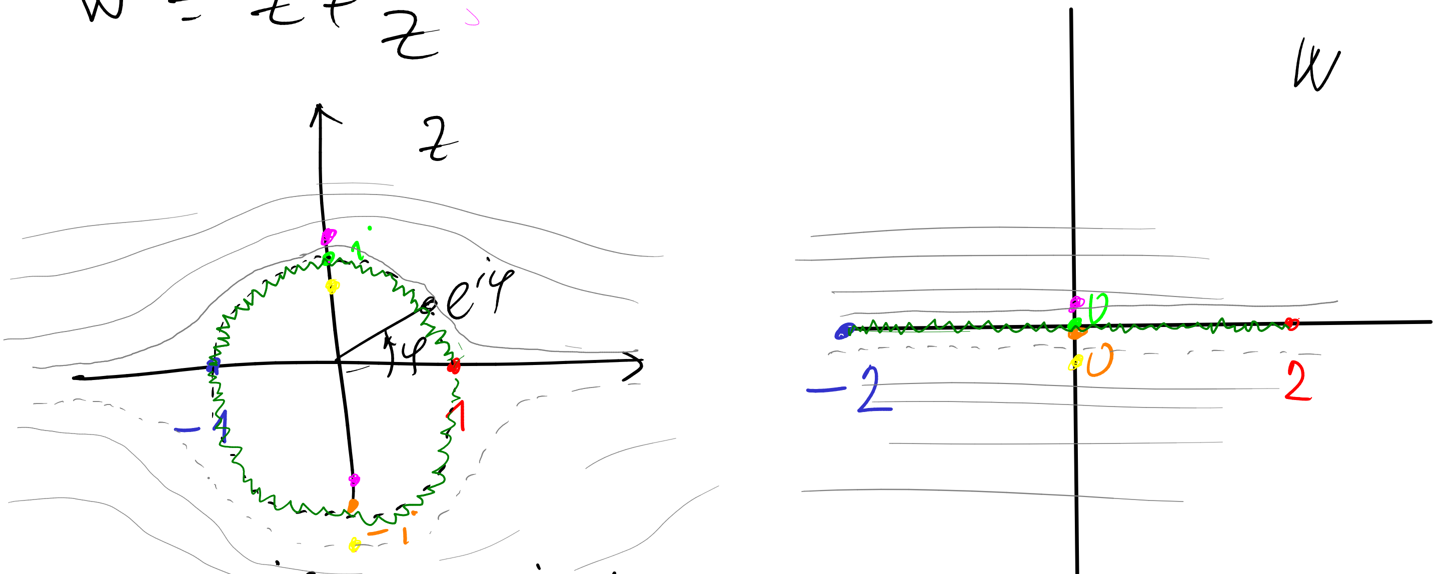
$$R = nr = \frac{2r}{1+r^2}$$

$$\frac{dz}{dr} = \dots$$



Žukovského zobrazení

$$w = z + \frac{1}{z}$$



$$z = e^{i\varphi} \Rightarrow w = e^{i\varphi} + \frac{1}{e^{i\varphi}} = 2\cos\varphi$$
$$= 2\,\mathrm{Re}\, z$$