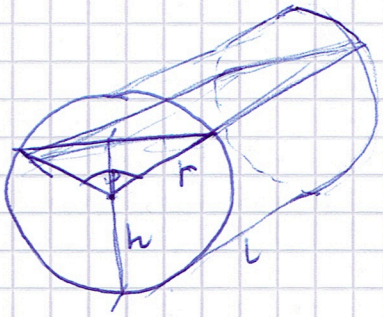
7

3



Geg.: $r, l, V_z = 2000\,l, V = 1500$

Ges.: h, φ

a) $A_{Total} = \pi r^2$

$A_{Segm} = \frac{r^2}{2}(\varphi - \sin(\varphi))$

$A = A_{Total} - A_{Segm}$

$= \pi r^2 - \frac{r^2}{2}(\varphi - \sin(\varphi))$

$= r^2\left(\pi - \frac{\varphi - \sin(\varphi)}{2}\right)$

$V = A \cdot l$

$1500 = l r^2\left(\pi - \frac{\varphi - \sin(\varphi)}{2}\right)$

$V_z = l \cdot \pi r^2 = 2000$

$l r^2 = \frac{2000}{\pi}$

$1500 = \frac{2000}{\pi}\left(\pi - \frac{\varphi - \sin(\varphi)}{2}\right)$

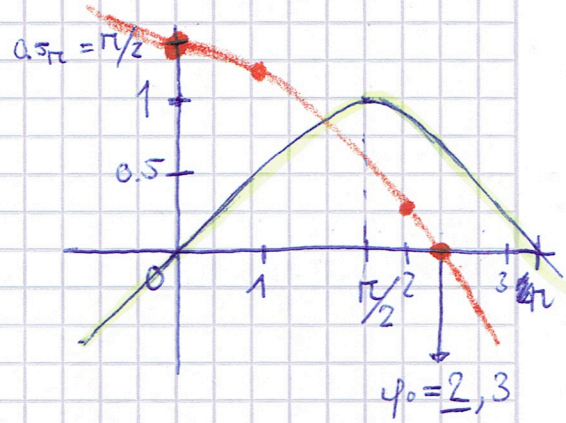
$\frac{3}{4} = \pi - \frac{\varphi - \sin(\varphi)}{2}$

$3/2\,\pi = 2\pi - \varphi + \sin(\varphi)$

$-0.5\pi = -\varphi + \sin(\varphi)$ Beweis

b) $f(\varphi) = \sin(\varphi) - \varphi + 0.5\pi$

$f(x) = \sin(x)$



Fixpunktiteration: $F(\varphi_n) = \sin(\varphi_n) + 0.5\pi$

$F(\varphi) = \sin(\varphi) + 0.5\pi \qquad \varphi_0 = 2$

n	φ_n
0	2
1	2.480...
2	2.185...
3	2.3879...
4	2.2550...
5	2.2345...
6	2.285...
7	2.3262...
8	2.2987...
9	2.3173...
↓	

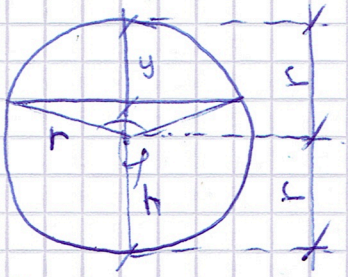
*n	φ_n
10	2.3048
11	2.313
12	2.307
13	2.311414
14	2.30884
15	2.30[illegible]94126
16	2.30[illegible]10157
17	2.30966
18	2.3002
19	2.30978
20	2.30994

→ $\approx 10^{-3}$ identisch ✓

7

c) $h = 2r - y$

$y = r \cdot (1 - \cos(\varphi/2))$



$\rightarrow h = 2r - r - r \cdot \cos(\varphi/2)$

$= r\,(1 + \cos(\varphi/2)) = r(1 + 0.4039..) = \underline{\underline{1.40396r}}$