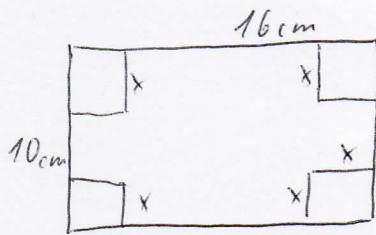S 41 Nr. 7

$\mathbb{D} = (0; 5)$

$V(x) = (16 - 2x)(10 - 2x) \cdot x \quad \text{Zielfunktion}$

$V(x) = (16 - 2x)(10x - 2x^2)$

$V(x) = 160x - 32x^2 - 20x^2 + 4x^3 = 4x^3 - 52x^2 + 160x$

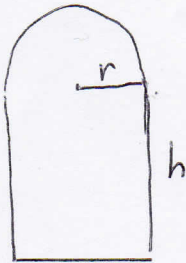$\text{Extrema} \Rightarrow V'(x) = 0 = 12x^2 - 104x + 160$

$$X_{1,2} = \frac{+104 \pm \sqrt{104^2 - 12 \cdot 160 \cdot 4}}{2 \cdot 12} = \frac{20}{3} \notin \mathbb{D}$$

$$X_2 = \frac{+104 - \sqrt{104^2 - 12 \cdot 160 \cdot 4}}{2 \cdot 12} = 2 \in \mathbb{D}$$

$V''(x) = 24x - 104 \quad ; \quad V''(2) = 24 \cdot 2 - 104 < 0 \Rightarrow \text{Max}$

$$V_{max} = V(2) = 4 \cdot 2^3 - 52 \cdot 2^2 + 160 \cdot 2 = 144 \, cm^3$$

S 41 Nr. 8

$A = \frac{1}{2} \cdot r^2 \cdot \tilde{\pi} + 2 \cdot r \cdot h = 45 \, m^2 \quad \text{Nebenbedingung}$

$h = \dfrac{45 - \frac{1}{2} r^2 \cdot \tilde{\pi}}{2r} = \dfrac{22{,}5}{r} - \dfrac{1}{4} r \cdot \tilde{\pi}$

$U = \frac{1}{2} \cdot 2 \cdot r \cdot \tilde{\pi} + 2r + 2h = r \cdot \tilde{\pi} + 2r + 2\left(\dfrac{22{,}5}{r} - \dfrac{1}{4} r \cdot \tilde{\pi} \right)$

$\underline{U(r)} = r \cdot \tilde{\pi} + 2r + \dfrac{45}{r} - \dfrac{1}{2} r \cdot \tilde{\pi} = \underline{\dfrac{1}{2} r \cdot \tilde{\pi} + 2r + \dfrac{45}{r}} \quad \text{Zielfunktion}$

notw. Bed Extrema

$U'(r) = \dfrac{\tilde{\pi}}{2} + 2 - \dfrac{45}{r^2} = 0 \Rightarrow \dfrac{\tilde{\pi}}{2} + 2 = \dfrac{45}{r^2} \Big| \cdot r^2$

$\dfrac{\tilde{\pi}}{2} r^2 + 2r^2 = 45 \Rightarrow r^2 \left(\dfrac{\tilde{\pi}}{2} + 2 \right) = 45 \Rightarrow r^2 = \dfrac{45}{\frac{\tilde{\pi}}{2} + 2}$

$r^2 = \dfrac{45}{\frac{\tilde{\pi} + 4}{2}} = \dfrac{90}{\tilde{\pi} + 4} \Rightarrow r = \sqrt{\dfrac{90}{\tilde{\pi} + 4}} \approx 3{,}55 \, cm \quad ; \quad h \approx 3{,}55 \, m$