

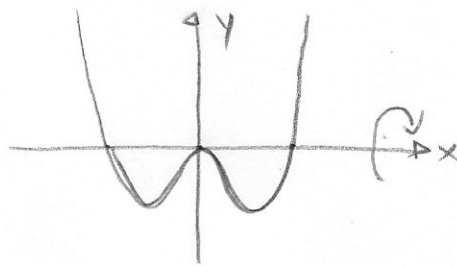
A4b

$$f(x) = x^4 - x^2$$

$$f(x) = x^2(x^2 - 1)$$

$x=0$   
doppelt

$$x^2 - 1 = 0 \\ x = \pm 1$$

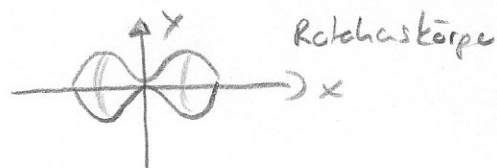


$$V = \pi \int_{-1}^1 f^2(x) dx = 2\pi \int_0^1 f^2(x) dx$$

$$= 2\pi \int_0^1 (x^4 - x^2)^2 dx =$$

$$= 2\pi \int_0^1 (x^8 - 2x^6 + x^4) dx = 2\pi \left[ \frac{1}{9}x^9 - \frac{2}{7}x^7 + \frac{1}{5}x^5 \right]_0^1 \approx 0.16 \text{ FE}$$

$$= 2\pi (H(1) - H(0))$$

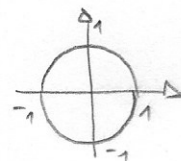


A4e)  $f(x) = \sqrt{1-x^2}$

diese Funktion könnte man vielleicht gleich als "Kreis" erkennen

$$y = \sqrt{1-x^2} \Rightarrow y^2 = 1-x^2$$

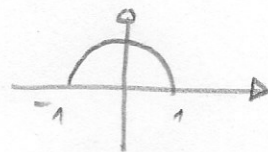
$$\Rightarrow x^2 + y^2 = 1$$



Somit ist  $y = \sqrt{1-x^2}$   
der obere Teil des Kreises

$$V = \pi \int_{-1}^1 f^2(x) dx = 2\pi \int_0^1 (\sqrt{1-x^2})^2 dx$$

$$= 2\pi \int_0^1 (1-x^2) dx = 2\pi \left[ x - \frac{1}{3}x^3 \right]_0^1 = 2\pi (H(1) - H(0)) \\ = 2\pi \left(1 - \frac{1}{3}\right) = \frac{4}{3}\pi$$



Es ist das Volumen einer Kugel mit Radius 1

$$V = \frac{4}{3}\pi r^3 \Rightarrow V = \frac{4}{3}\pi \cdot 1^3 = \frac{4}{3}\pi$$

mit  
 $r=1$

A6

$$f(x) = ax^2 + b$$

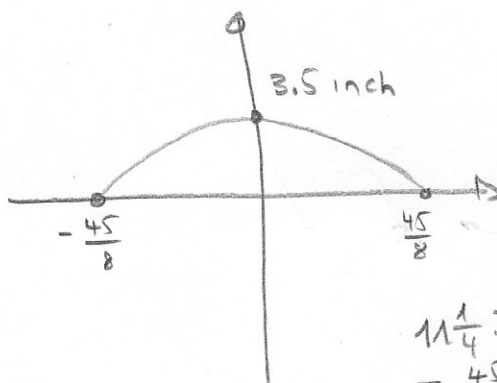
$$f(x) = ax^2 + 3.5$$

$$f\left(\frac{45}{8}\right) = 0$$

$$a \cdot \left(\frac{45}{8}\right)^2 + 3.5 = 0$$

$$a \cdot \left(\frac{45}{8}\right)^2 = -\frac{7}{2}$$

$$a = -\frac{224}{2025}$$



$11\frac{1}{4}$  Inch  
 $= \frac{45}{4}$  daraus

folgt das  
 Intervall

$$\left[-\frac{45}{8}, \frac{45}{8}\right]$$

$$\Rightarrow f(x) = -\frac{224}{2025}x^2 + \frac{7}{2}$$

$$V = \pi \int_{-\frac{45}{8}}^{\frac{45}{8}} f^2(x) dx = 2\pi \int_0^{\frac{45}{8}} \left(-\frac{224}{2025}x^2 + \frac{7}{2}\right)^2 dx$$

$$= 2\pi \int_0^{45/8} \left(\frac{50176}{4100625}x^4 - \frac{1568}{2025}x^2 + \frac{49}{4}\right) dx$$

$$= 2\pi \left[ \frac{50176}{20503125}x^5 - \frac{1568}{6075}x^3 + \frac{49}{4}x \right]_0^{45/8}$$

$$= 2\pi \left( H\left(\frac{45}{8}\right) - H(0) \right) = 2\pi \frac{147}{4} = \frac{147\pi}{2} \approx 230.91 \text{ Inch}^3$$

$$230.91 \text{ Inch}^3 \approx 3783.89 \text{ cm}^3$$

$$\approx 3.78 \text{ dm}^3$$

$$230.91 \text{ Inch}^3 \cdot 2.54^3 \frac{\text{cm}^3}{\text{Inch}^3} \approx 3783.89 \text{ cm}^3$$

